A Dmo(c)

M.O. 546

The Marine Observer

A quarterly journal of Maritime Meteorology

Volume XXI No. 152

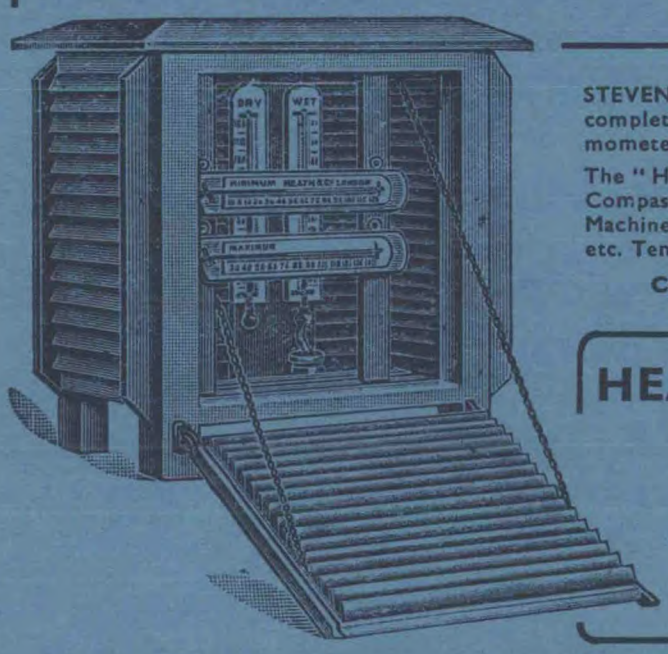
April, 1951

FIVE SHILLINGS NET

TRADE HEZZANITH MARK

Specialists in Meteorological and Scientific Instruments

There is a century of rich experience behind the manufacture of every "Hezzanith" instrument.



STEVENSON'S SCREEN (No. E691), as illustrated, complete with maximum thermometer, minimum thermometer, and Wet and Dry Bulb thermometer.

The "Hezzanith" range of products includes Sextants, Compasses, Binnacles, Binoculars, Telescopes, Sounding Machines, Chart Instruments, Clocks, Aneroids, Rules, etc. Temperature Indicating and Recording Instruments.

Catalogues are available upon request.

HEATH & COMPANY
(Incorporated with W. F. Stanley & Co., Ltd.)
NEW ELTHAM, LONDON, S.E.9.

Phone:-Eltham 3836. Grams: "Polaris, Phone" London.

MARINE OBSERVER'S HANDBOOK

7th Edition, 1950

Part II of the Manual of Meteorological Observing.

The handbook was written partly to assist officers in British Commonwealth vessels, who voluntarily carry out observations at sea for the Meteorological services, to do the work in the most efficient and uniform way, and partly to provide a reference book for mariners interested in meteorology or who are entering for masters' and mates' examinations. It therefore provides a comprehensive and valuable source of information for those who are interested in Meteorology, but who have little or no specialized knowledge.

ILLUSTRATED

Price 8s. 6d. *By post 8s. 10d.*

from

HIS MAJESTY'S STATIONERY OFFICE

at the addresses shown on the title page, or through any bookseller.

M.O. 546 AIR MINISTRY

THE MARINE OBSERVER

A Quarterly Journal of Maritime Meteorology

prepared by the

Marine Branch of the Meteorological Office

VOL. XXI No. 152 APRIL, 1951

TABLE OF PRINCIPAL CONTENTS

	Page
Editorial	70
The Marine Observers' Log—April, May and June	72
Waterspouts—Part II. By A. H. Gordon, M.S.	87
The Institute of Navigation	93
The Challenger Society	96
Southern Ice Reports—April, May and June, 1950	98
"Methop." By J. B. Wallace	99
National Oceanographic Council	101
Oceans through the Ages. By C. E. P. Brooks, I.S.O., D.Sc.	103
Ice in the Newfoundland Region during February, 1950. By P. R. Brown, M.Sc., D.I.C.	111
Recent British Marine Meteorological and Surface Current Atlases. By H. Jameson, D.Sc.	115
Presentations for Long-Service as Voluntary Observers	119
Use Made of Atlantic Weather Bulletin	123
Observing the Apparent Wind on Shipboard. By F. Graham Millar and H. W. MacPhail	126
Captain R. E. Beare	131
Captain C. G. Bonner, V.C.	131
Captain L. A. Brooke Smith, R.D., R.N.R.	133
Personnel	136

Letters to the editor, and books for review, should be sent to The Editor, "The Marine Observer," Meteorological Office, Headstone Drive, Harrow, Middlesex.

Published for the Meteorological Office by
HIS MAJESTY'S STATIONERY OFFICE

Crown Copyright Reserved

To be purchased from
York House, Kingsway, LONDON, W.C.2 429 Oxford Street, LONDON, W.1
P.O. Box 569, LONDON, S.E.1
13a Castle Street, EDINBURGH, 2 1 St. Andrew's Crescent, CARDIFF
39 King Street, MANCHESTER, 2 Tower Lane, BRISTOL, 1
2 Edmund Street, BIRMINGHAM, 3 80 Chichester Street, BELFAST
or from any Bookseller

Printed in Great Britain under the authority of His Majesty's Stationery Office by
The Campfield Press, St. Albans, Herts
S.O. Code No. 40-38-4-51

PRICE 5s. NET or £1 1s. 0d. per annum (post free)

EDITORIAL

It has been customary for many years to hold at St. Paul's Cathedral an annual service for seafarers at which, despite the fact that it takes place at 5 p.m. on a weekday, every seat is taken. The congregation is composed of seafarers and their wives and families, and their colleagues who have " swallowed the anchor ", and representatives of various organisations connected with the sea—shipowners and brokers and marine insurance men—and, in fact, of people generally who are actively interested in ships and seamen. St. Paul's is not far from Leadenhall Street, nor from the Admiralty, nor from the Pool of London, and realising the City of London's close association with our shipping history, it seems fitting that Wren's lovely Cathedral should give, as it does, a warm welcome to its nautical congregation, and it is surely fitting that as an island race whose past, present and future is so inevitably bound up with the sea, some of us should, as Christians, gather together once a year in the centre of our ancient capital and give thanks to our Creator for the past and pray a little for the future.

This annual service originated in the year 1905, appropriately enough the centenary year of the death of Nelson. The suggestion arose in a letter to a newspaper by a master mariner.

The organisation of this service, which is quite considerable, is ably carried out each year by Mr. Smith, Clerk to the Honourable Company of Master Mariners. The choir usually includes boys from the Nautical Training Establishments. The red ensign—that old red duster—together with the blue ensign and flags of certain Nautical Training Establishments, are paraded and laid before the altar. The vast congregation joins lustily in the singing of well-known hymns, and it is, in fact, a bright and cheerful occasion.

At the service held in October, 1950, the Rev. C. M. Armitage, Chaplain in Ordinary to the King, pointed out in his address that it was seamen in the persons of the Galilee fishermen, among them St. Peter, who were Christ's most ardent disciples and thus formed, as it were, the backbone for the spread of Christianity throughout the world. The mariner, from the very nature of his job, was essentially manly, and spending a lot of time in his own company he therefore tended to be thoughtful and to ponder upon the why and the wherefore and upon the frailties of men and women and kings and governors, and being so close to nature he tended to be simple and straightforward, and in his frequent struggles with the elements he did at least appreciate the power of nature and the benefits she could give him if properly understood. Perhaps that was partly why these early sailors so readily responded to this call of a new and essentially kindly religion. The mariner of any era probably tended to be a respecter of religious principles, and his general international outlook made him a good citizen of the world.

The general impression that one gathered from this address was that the sailor was not such a bad fellow after all. The boy or man who goes to sea, even in these prosaic days of diesel and radio, sees an enormous amount of the beauties of nature which his friends ashore, with their cinemas and football matches and perhaps rather humdrum lives, can never hope to see. It is when one " swallows the anchor " that one realises the full truth of this and experiences waves of nostalgia for the sea. One does not think of the discomfort of bunkering in Barry Dock, or punching into a south-east gale

in the North Sea, or sailing from Liverpool on a Saturday noon, but of the pleasant comfort of a homeward-bound passage between Pernambuco and the Bay, or the scene on entering Vancouver harbour on a sunny morning, or of the close comradeship of good shipmates. One even has pleasant recollections of the exhilaration of a gale at sea and the majesty of the waves, and the sea-worthy way in which some particular ship so rarely took heavy water aboard, and that indefinable pleasure of taking personal part in a physical contest—ship and the skill of the navigator versus the sea. All these things are really infinitely more attractive and interesting to anyone who has the spark of adventure in him, when one comes to think about it, than, say, standing in a suburban train for 20 minutes or so each night after sitting in an office all day—even if one is bound for home.

On reflection, it is perhaps surprising to what extent meteorology comes into the life of the seaman—and of the landlubber as far as that goes—but the seaman can scarcely do anything without being affected in some way or another by weather. His navigation, the safety of his ship, his physical comfort, loading, discharging and care of his cargo, are all directly and immediately affected by weather. His food and clothing and the very cargo he carries are also affected of course, but these concern us all. It is no wonder that seamen show an interest in meteorology, as can be seen by the admirable observations recorded each quarter in " The Marine Observers' Log ". That they take an interest in other scientific work can be seen by the somewhat more spectacular exploits of such notable seamen as Scott, Shackleton, Cook and Dampier.

* * *

On another page in this number is a notice about the death of Captain L. A. Brooke-Smith, Marine Superintendent of the Meteorological Office from 1919 to 1938. His passing brings to mind the fact that it was a sailor, Admiral Fitzroy, with an interest in meteorology who was the first Director of the Meteorological Office when it was formed as a department of the Board of Trade in 1854. The Marine Branch is thus the oldest branch of the Meteorological Office, and ever since Admiral Fitzroy's day there has always been a seaman—usually a master mariner—as Marine Superintendent, maintaining contact between that department and the masters and officers of the Merchant Navy and, indeed, with all the maritime world. We regret the passing of Captain Brooke-Smith, which means that another link with the past has been severed.

MARINE SUPERINTENDENT.

The Marine Observers' Log

APRIL, MAY AND JUNE

The Marine Observers' Log is a quarterly record of the most unusual and significant observations made by mariners.

The observations are derived from the logbook of marine observers and from individual manuscripts. Photographs or sketches are particularly desirable.

Responsibility for each observation rests with the contributor.

CHANGE OF SEA COLORATION

Off the coast of North Africa

M.V. *City of Evansville.* Captain D. C. Hamilton. Port Said to Hull. Observers, the Master and Mr. J. S. Schofield, 2nd Officer.

16th April, 1950, 1350 G.M.T. Off Cape Bengut we observed a clearly defined change in the colour of the sea from dark blue to very pale green, as if the ship had suddenly entered shallow water. Echo soundings were taken and no bottom obtained at 600 fathoms. The charted depth was 1,000 fathoms. The line of demarcation ran in a N × W/S × E direction from the coast to about 16 miles off shore. After steaming for about 2½ miles, the colour was seen to be reverting to its original blue. The change was gradual and no distinct line of demarcation could be seen. After a further 1½ miles the colour was the normal deep blue. The sea appeared confused in the discoloured area but no difficulty was experienced in the steering of the ship, her course and speed being maintained throughout. Course 264°, speed 12¼ knots. Wind 270° force 2. Sea and swell slight, NNW'ly. Air temp. 62°F. The sea temp. was 62½° throughout the whole period. Cloud 2/8 Cu. Visibility excellent.

Position of ship: Latitude 37° 05'N., Longitude 4°08'E.

SUBMARINE DISTURBANCE

Gulf of Aden

S.S. *City of Windsor.* Captain W. S. Doidge. Aden to Mombasa. Observers, the Master and Mr. A. G. Brooks, 3rd Officer.

9th May, 1950, 0610 G.M.T. The vessel was felt to shudder bodily for a period of 4 seconds. The shuddering was akin to that experienced by a vessel

of light draft going full astern. Later it was ascertained that another vessel about 30 miles to the east had experienced the same effect. No undue sea disturbance was observed.

Position of ship: Latitude 12° 22′N., Longitude 47° 21′E.

Note. Submarine earthquakes have previously been reported in the Gulf of Aden and vicinity on a few occasions.

CURRENT SET

Vicinity of Galapagos Islands

S.S. *Paparoa.* Captain H. C. R. Dell. Panama to New Zealand. Observer, Mr. F. I. Christall, 3rd Officer.

12th April, 1950, 0530 to 1420 A.T.S. While passing to the northward of Abingdon and Albemarle Islands, an E'ly to ENE'ly set was experienced over a period of nine hours, the average rate being 1 to 1¾ knots. Previous to this the set had been generally NW'ly, averaging ¾ knot.

Position of ship: At 0530 A.T.S.: Latitude 1° 37′N., Longitude 90° 01′W. At 1420: 0° 17′N., 91° 30′W.

LINE OF DEMARCATION

Vicinity of Galapagos Islands

T.S.S. *Tekoa.* Captain H. A. Horwood. Napier to Panama. Observer, Mr. P. B. Eccles.

19th April, 1950, 0935 L.M.T. While proceeding through a smooth sea an apparent line of breakers was sighted on the bow. From a distance of 1¼ miles these " breakers " still had the appearance of a shoal or tide rip, the water on the other (northward) side being of a slightly darker hue. On closer investigation these " breakers " were found to be a thick white scum floating on the surface. This ran in an intermittent straight line in a 100° direction and stretched to our knowledge for 18 miles, but on being left astern could be seen stretching as far as the eye could see.

Two points of interest were noted: (1) that the sea temperature, which for days previously had been in the region of 79°F., dropped 5° soon after crossing the white line; (2) that the set experienced on the next day was 106°, drift 12 miles, whilst for days before, the set had been strong to the westward.

Position of ship: Latitude 3° 24′S., Longitude 92° 14′W.

Note. As shown in M.O.435, *South Pacific Ocean Currents*, the currents in the open ocean surrounding the Galapagos Islands are mainly between north-west and south-west, but occasional currents in every other direction may occur. This accounts for the easterly sets observed by S.S. *Paparoa* and T.S.S. *Tekoa.*

The region is a very interesting one, from the point of view both of current and of changes in sea temperature. In the vicinity of the Galapagos Islands, strong currents are observed up to 2½ knots, with some difference of direction among the islands and sometimes counter currents inshore. Offshore winds may cause upwelling of colder water, and large differences of sea surface temperature have been observed. On one occasion this temperature was 20°F. less on the lee side of the largest island, Isla Isabela, than on the windward side.

More or less sudden changes of sea temperature have also been reported in the ocean surrounding the islands. Thus M.V. *Orari*, on 15th August, 1947, in lat. 00° 19′S., long. 96° 11′W., experienced a fall of 5°F. in three hours, with a total fall

of 18° in 12 hours (see *Marine Observer*, Vol. XVIII, 1948, p. 140). On 3rd October, 1938, M.V. *Rangitiki* was in lat. 4° 07'S. long. 95° 41'W. at noon, the sea temperature being 68°F. By 4 p.m. this had fallen 7° to 61°, and by 8 p.m. a further 3° to 58°. In the four subsequent hours it rose 10° to the original value of 68°.

The explanation of these changes in the open ocean is that in this region the cooler water of the Peru Current is turning westward across the ocean and mixing with the warmer water coming from the Gulf of Panama to form the beginning of the South Equatorial Current. In this process, streaks or patches of water of different temperature may lie adjacent to one another at times. The cool current setting 106°, observed by T.S.S. *Tekoa*, was in direct opposition to the normal flow of the Peru Current in this region; the probable explanation of this is that current eddies are formed at times in various places in the process of the mixing of the waters. There is, however, another source of relatively cool water in this neighbourhood, and also elsewhere in Equatorial regions. Between the Equator and lat. 4° or 5°S., cool water is upwelling from below the surface as part of the mechanism of the west-going flow of the South Equatorial Current in this area.

Caribbean Sea

M.V. *Hurunui*. Captain A. E. Williams. Colon to Curaçao. Observer, Mr. P. Moulton, 3rd Officer.

3rd May, 1950, 1832 G.M T. The ship passed from cloudy greenish to dark-blue clear water. The colour change was very marked and the dividing line stretched from horizon to horizon from 110° to 290°. Shortly before crossing the line a small floating tree trunk was passed and shortly after a piece of timber. The sea temperature was constant at 80°F.

Position of ship: Latitude 11° 28'N., Longitude 75° 02'W.

Note. The green cloudy water observed by M.V. *Hurunui*, showing the same temperature as the blue water, was probably the outflow of the Rio Magdalena.

CURRENT RIPS

South Atlantic Ocean

S.S. *Clan Forbes*. Captain W. R. Woodriffe. Birkenhead to South Africa. Observer, Mr. J. S. Cumming, 3rd Officer.

17th May, 1950, 1535 G.M.T. The vessel passed through strong current rips running approximately N–S. There was no sounding at 250 fathoms.

Position of ship: Latitude 08° 12'S., Longitude 05° 18'E.

PHOSPHORESCENCE

Indian Ocean

M.V. *Herefordshire*. Captain H. Davies. Colombo to Aden. Observer, Mr. J. F. Whiteside, 3rd Officer.

5th June, 1950, 1500 G.M.T. The sea began to show spots of phosphorescence flashing at about one second intervals. At 1545 large patches were seen measuring about 50 yards square. The phosphorescence increased in brilliancy and at 1710 a rain squall was seen approaching. Immediately the rain started, streaks measuring about 30 yards by 5 yards appeared, and as the rain became heavier and the wind increased so the phosphorescence became more brilliant. After two minutes the squall passed and immediately the phosphorescence disappeared, except for traces in the wash of the vessel.

At 1800 spots again appeared in the water but not of the same brilliance and by 1830 the phenomenon had dispersed. Weather conditions: wind SW/W, 4; slight sea and swell; air temp. 76°F.; sea temp. 79°.

Position of ship at 1500: Latitude 7° 08'N., Longitude 78° 34'E.

North Atlantic Ocean

M.V. *Warwick Castle.* Captain J. Trayner. Southampton to Cape Town. Observer, Mr. C. M. Hart, 3rd Officer.

12th April, 1950, 0001 G.M.T. Extensive phosphorescence in the form of broken wavetops was visible to the horizon in all directions. The horizon itself appeared to be illuminated and the lights of a ship in sight appeared dim by contrast.

Position of ship: Latitude 17° 56'N., Longitude 17° 30'W.

Gulf of Siam

S.S. *Kweiyang.* Captain W. B. B. Paul. Singapore to Bangkok. Observer Mr. V. Walker, 2nd Officer.

16th April, 1950, 1910 G.M.T. A broad band of light giving the impression of phosphorescent surf breaking was seen ahead. At 1915 the ship entered this zone and the phenomenon was seen to resemble moving bands of light on the surface of the water.

Between 1920 and 1930 the brightness intensified and the luminous effect came from what can best be described as a compact mass of curved bands of light. One had the impression of hundreds of searchlight beams sweeping the surface of the sea from as many different positions at a uniform rate of about 90 revolutions per minute.

This zone of brilliantly luminous water, which extended all round to the horizon, seemed to be divided into patches where the beams appeared to come from a common centre. By 1935 the brilliance of the display had diminished and only isolated spots and curved bands of light could be seen. These faded and grew less until 1940 when they were lost to view astern.

This phenomenon cannot be explained by ordinary phosphorescence since neither the ship's bow wave, wake nor breaking wavelets glowed or altered the pattern of the display. The brightness was on the surface of the water and had no depth. When illuminated by an Aldis lamp the sea had a dull, mottled appearance and streaks of scum could be seen on the surface.

At 1935 the following readings were taken: Sea water: hydrometer reading 1027; temp. 84°F. Air temp. 84°. Dew point 78°. Weather conditions: no moon, partly cloudy, dark and clear. Wind WSW, 5 knots. Slight sea and short, low swell.

Position of ship at 1910: Latitude 8° 15'N., Longitude 102° 34'E.

Note. This is a very unusual observation. Accounts of the rotating phenomenon known as the " phosphorescent wheel " have appeared from time to time in *The Marine Observer*, and an account of the observation of the S.S. *Laomedon*, together with a note giving a general description of the " wheel ", will be found in Vol. XX, January, 1950, p. 6.

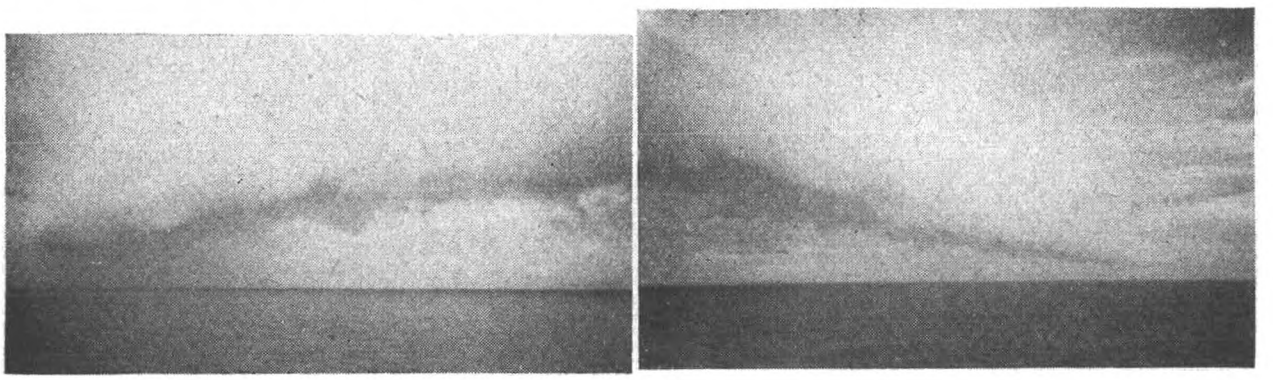
The special point of interest about the present observation is the fact that a number of centres, each with its own set of revolving beams, were in action at the same time.

LINE SQUALL

South Atlantic Ocean

M.V. *Pampas*. Captain R. C. S. Woolley, R.D., R.N.R. United Kingdom to Rio Grande Do Sul. Observer, Mr. J. A. Martin, 2nd Officer.

19th June, 1950, 1910 G.M.T. A line squall stretching from 300° to 120° was encountered moving NNE. The wind changed from NNE, force 1–2,



Port side, looking forward (195°) Starboard side, looking forward (235°)
Line Squall approaching

to SSW, force 7–8, dying down after 1920 to become light airs by 2100. The barometer rose 2 mb. and the temperature dropped from 72°F. to 66°.

Starboard quarter (030°)
Line Squall receding, having passed over ship

The sky was cloudless except for the squall cloud and about 1/8 Ci. which seemed to precede the line squall. Course 214°, speed 14 knots.

Position of ship: Latitude 30° 16′S., Longitude 49° 52′W.

UNUSUAL RADAR ECHO

Caribbean Sea

M.V. *Hurunui*. Captain A. E. Williams. Curaçao to London. Observer, Mr. P. Moulton, 3rd Officer.

5th June, 1950, 0130 G.M.T. The ship passed close to the west of a very dark, low cloud when 8 miles west of Seroe Ventana Light, Bonaire Island.

With the radar (268) operating a 30,000 yard scan, no echo was observed. A few minutes later a very sharp echo appeared on the P.P.I. off the starboard quarter at 6,000 yards. The echo was remarkable in its intensity and had a curving trail extending some 2,000–3,000 yards behind it as it moved across under the stern. It then died quite rapidly and disappeared within the 20,000 yard ring.

The echo in no way resembled that from a rain squall and no disturbance of the barograph or change in air temperature occurred. Watch was kept through glasses for a waterspout but none was observed.

Note. This observation has been referred to the Ministry of Transport for information.

WATERSPOUTS

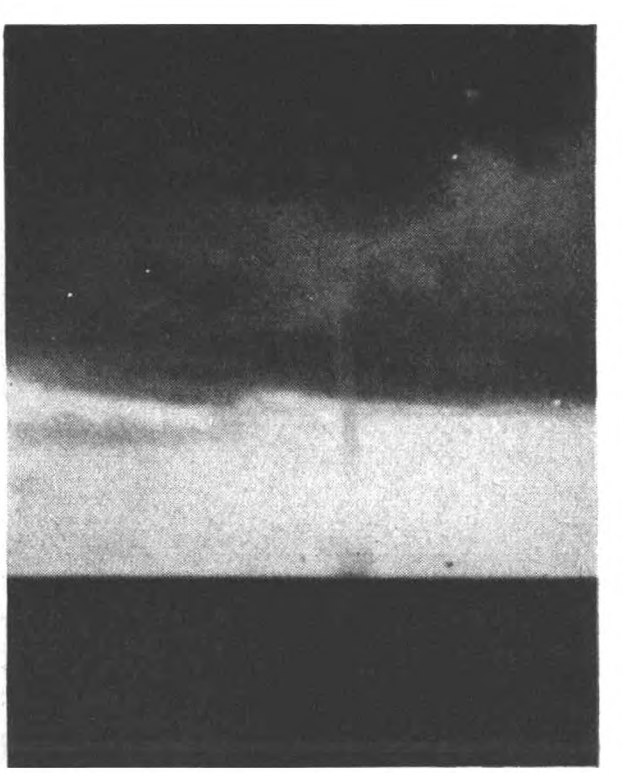
North Atlantic Ocean

S.S. *Edinburgh Castle.* Captain T. W. McAllen. Cape Town to Southampton. Observer, Mr. G. D. Attwood, Jun. 4th Officer.

6th April, 1950, 1630 G.M.T. The sky was 4/8 covered with large ragged Cb. base 500–800 ft., when a waterspout began to form from the base of a large Cb. on the starboard bow. At 1640 the spout was fully formed and bore approximately 4 points to starboard distant 5 miles. Our course was then altered towards it to facilitate observation.

On nearing the spout it was seen to be almost vertical with spray rising from its base to a height of 50 ft. It was pipelike or tubular in appearance,

First spout, early stages



First spout, later stages

about 40 ft. in diameter and almost transparent. A whirling cloud of vapour spiralled upward in the centre with a clockwise motion. The spray at the base gave the impression of a mirage for two or three minutes.

At about 1650 another spout began to form about 20° to the left of the

first and swept down to the sea in the form of a flattened S. It was visibly thinner than the first, being about 20 ft. in diameter.

The ship approached within about 1¾ miles of the first and ¾ mile of the second. Both were clearly defined but an attempt to sight them on radar was unsuccessful. The spouts were stationary as there was no wind. At 1700 both faded and disappeared. Barometer 1008·1 mb. Air temp. 86°F. Wet bulb 79°. Sea temp. 86°.

Position of ship: Latitude 5° 00′N., Longitude 12° 33′W.

Note. The fact that this waterspout was not visible on the radar screen is interesting; possibly this is due to the small size of the waterdrops forming the spout. This observation has been referred to the Ministry of Transport and to other radar experts.

Second spout

O.W.S. *Weather Recorder.* Captain A. W. Ford. On Station "Item".

19th May, 1950, 1740 G.M.T. A waterspout was seen forming to the NNE, then moving rapidly southward, with spray whirling up to about 100 ft. The rotation was clockwise and the spout moved directly under a roll of cloud, at the forward edge of a Cb., which showed no funnel formation. The spout was observed over a period of four minutes, during which it moved about 1½ miles. A moderate hail shower occurred and the wind veered about 10° behind the spout.

Position of ship: Latitude 59° 13′N., Longitude 19° 00′W.

Arabian Sea

S.S. *Orbita.* Captain J. Sutherland. Liverpool to Hong Kong. Observer, Mr. G. E. Mitchell, 3rd Officer.

2nd April, 1950. An arch squall orientated NNE–SSW and moving in a W'ly direction passed over the ship, the base of the associated Cb. being about 1,500 ft. Four waterspouts were seen to form in the rear of the squall. At 0354 G.M.T. a funnel cloud formed and developed into a spout by 0357. A minute later both cloud and spout had dispersed. At 0400 two funnel clouds appeared simultaneously, later forming spouts, one at 0405 which lasted three minutes and the other at 0409 of duration two minutes. A fourth spout lasting about one minute was noted at 0424.

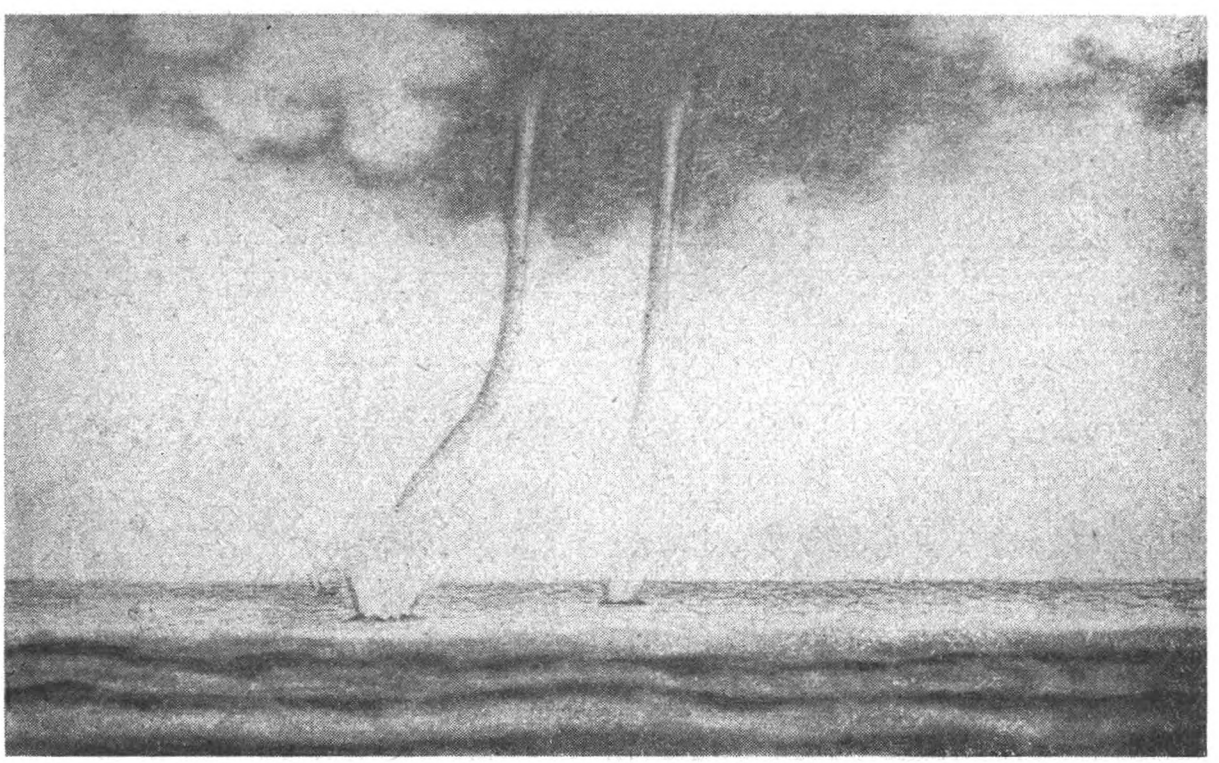
Precipitation was seen on the N and S horizons but none was observed in the vicinity of the spouts or at the ship. It was not possible to observe the amount of disturbance on the sea surface. Sea and air temperatures 85°F. Wind NE, force 3.

Position of ship: Latitude 7° 34′N., Longitude 76° 18′E.

North Pacific Ocean

S.S. *Dallas City*. Captain C. E. Exton. Vancouver to United Kingdom. Observer, Mr. N. C. Pascoe, 2nd Officer.

31st May, 1950, 2125 G.M.T. Two spouts were observed from 2/8 Cb., base about 4,600 ft., bearing due E, distance 5 miles. There was no apparent



movement and both subsided after 10 minutes. Spray was clearly visible and reached a height roughly estimated at about 150 ft. There was no change in wind direction or force. Barometer 1008·8 mb., steady; air temp. 82·5°F.; sea 82·5°; 2/8 Cu. and 4/8 Cs. were also present.

Position of ship: Latitude 10° 09′N., Longitude 87° 24′W.

ARTIFICIAL CLOUD FORMATION

North Atlantic Ocean

S.S. *Athelstane*. Observer, Mr. A. R. Badcock, 3rd Officer.

4th June, 1950, 1400–1600 G.M.T. The day was fine and clear with a few small detached tufts of Cu. The funnel gases were ascending almost vertically. At an estimated height of 1,500–2,000 ft. these gases were causing the formation of Cu. above the ship. The process was not continuous, the tufts only forming when in the vicinity of those already in being.

It was possible to discern much of the process taking place. The artificial cloud showed considerable turbulence as it was forming and in spreading out it soon joined up with the natural cloud, after which the whole mass drifted away in a detached unit.

As the funnel gases were of a pale blue colour it was interesting to observe them being assimilated in each tuft of cloud as it formed. Air temp. 78°F. Wind S, 11 knots. Course 003°, speed 11 knots.

Position of ship: Latitude 35° 10'N., Longitude 61° 12'W.

EXCEPTIONAL VISIBILITY

Approaching Tenerife

M.V. *Winchester Castle.* Captain H. A. Deller. Cape Town to Southampton. Observers, Mr. W. Anson, 1st Officer, and Mr. L. P. H. Sayles, 4th Officer.

11th June, 1950, 1718 G.M.T. While proceeding on a N'ly course towards Tenerife, Pico de Teide was clearly observed bearing 013°(T), distant 111 miles, giving the ship's position at lat. 26° 28'N., long. 17° 06'W.

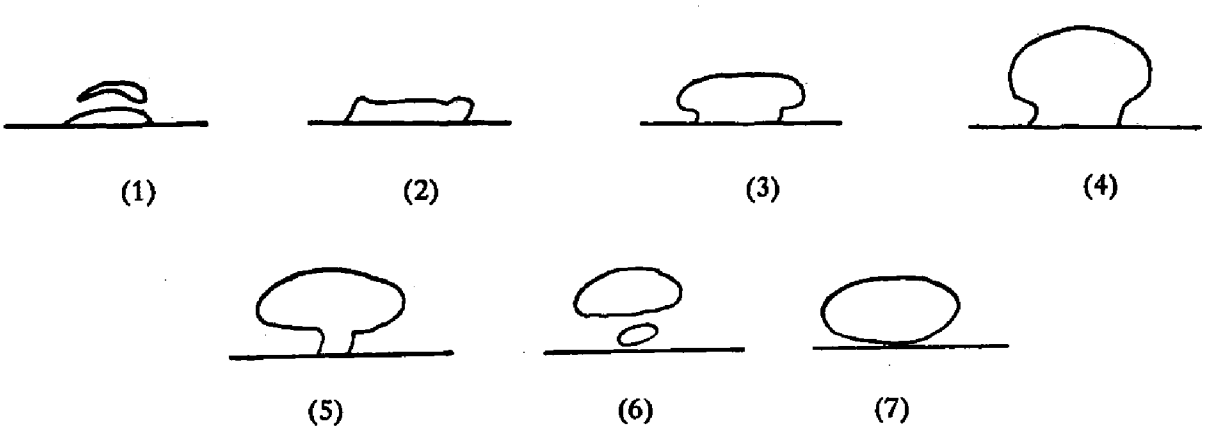
Air temp. 70°F., humidity 60 per cent, sea temp. 72°. The breeze was N, force 3, and the predominant cloud over and to S of the ship was 3/8 Cu. plus 3/8 Ac. There were no clouds in the vicinity of the island.

ABNORMAL REFRACTION

Off coast of Portugal

M.V. *Australind.* Captain J. F. Wood. Port Said to Bremen. Observer, Mr. D. Ewan, Chief Officer.

27th April, 1950, 0546–0549 G.M.T. The accompanying sketches picture the sequence of shapes assumed by the sun as a result of refraction. After



clearing the horizon the sun slowly regained its normal proportions and at an altitude of 1½° no refraction was apparent. No land was visible near the phenomenon. Wind N, force 4. Barometer 1020·3 mb., air temp. 58°F. Sky cloudless.

Position of ship: Latitude 38° 04'N., Longitude 9° 24'W.

Gulf of Panama

S.S. *Pacific Importer*. Captain B. M. Collard. Balboa to Los Angeles. Observer, Mr. E. H. Gregson, 3rd Officer.

21st May, 1950. The loom of Cape Mala Light (7° 28'N., 80° 00'W.), visible 16 miles, was seen at a distance of 33 miles and the light itself at 24 miles. Height of eye 45 ft. Air temp. 80°F., sea temp. 83°. Cloudy and clear weather.

Gulf of Cadiz

T.S.S. *Esperance Bay*. Captain T. V. Roberts, R.D., R.N.R. Malta to Southampton. Observer, Mr. J. K. Wyles, 3rd Officer.

26th June, 1950. Between Cape Trafalgar and Cape St. Vincent exceptional visibility of shore lights was observed. Lights of 17 and 21 mile ranges were sighted clearly, without loom, 37 and 39 miles off respectively.

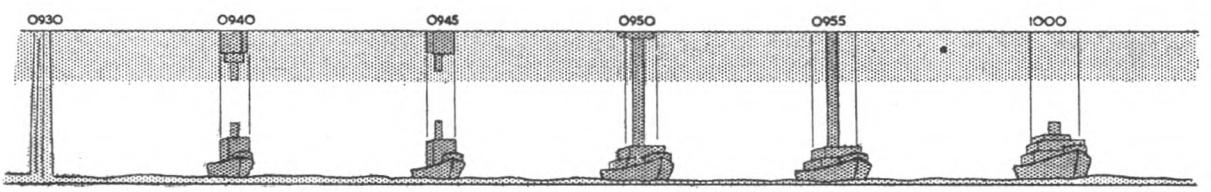
Position of ship at 0001 G.M.T.: Latitude 36° 25'N., Longitude 7° 20'E.

MIRAGE

Gulf of Cadiz

S.S. *Orbita*. Captain J. Sutherland. Hong Kong to Liverpool. Observer, Mr. G. E. Mitchell, 3rd Officer.

21st May, 1950, 0930–1030 G.M.T. All morning there had been a double horizon with occasional irregularities in both the true and false horizons. This was particularly noticeable where land was visible beyond the sea horizon. At 0930 an object was sighted bearing 295°, giving the impression of a tall waterspout without a funnel cloud, at the most 3 miles away. Through



the glasses, however, it was seen to be a ship, approaching on roughly the opposite course, with an inverted image on the false horizon above it. As it approached, the upper portion of the inverted image began to fade, the hull disappearing first and then the deckhouses. At this stage the ship appeared to have exceptionally tall masts and funnel. The image faded completely by the time the vessel, which was seen to be a small cargo ship, was 3 miles away. Over the same period a similar, though not so pronounced phenomenon was observed on the port side. A complete inverted image was not observed here. The sequence was observed in the reverse order when the vessel was disappearing astern. The air temperature was 73°F.

Position of ship: Latitude 37° 14'N., Longitude 7° 10'W.

LUNAR RAINBOWS

Australian Waters

S.S. *Empire Brent.* Captain E. Laidlaw. Aden to Fremantle. Observer, Mr. H. Tomson, 3rd Officer.

4th May, 1950, 1335 G.M.T. A partial lunar rainbow was observed bearing 255°, height 10°, followed by frequent complete bows stretching from 255° to 330°, height 21°. The moon's altitude was 23° bearing 115°.

At 1410 a bow appeared to be about 300 ft. from the bridge, the ends seeming to rise from the water. All colours from blue to red were visible, being somewhat paler than those associated with solar bows.

There was a considerable amount of Cu. with frequent fine rain squalls and bows were observed after each squall had passed until 1515. It was noticed that as the moon rose the height of the bows decreased. The heights were not observed owing to rain and interference from after-deck lights.

Position of ship: Latitude 26° 35'S., Longitude 104° 01'E.

Note. In viewing a rainbow the observer's eye is in a straight line between the sun's or moon's centre and the centre of the circle of which the rainbow forms an arc. As the radius of the upper (outside) of the red band of a rainbow is 42° 22', the bow will be entirely below the horizon if the sun's or moon's altitude exceeds this value. When the sun or moon is set at some lower altitude, some part of the rainbow will be seen. At any given moment the sun's or moon's altitude plus the altitude of the apex of the bow must be equal to about 42°. Hence with increase of the sun's or moon's altitude that of the bow decreases, as noted in the above observation, and vice versa.

RAINBOW EFFECTS

North Atlantic Ocean

M.V. *Pacific Exporter.* Captain E. A. Kemp. Vancouver to Liverpool. Observer, Mr. R. E. G. Simmons, 1st Officer.

18th May, 1950. The following observations were made of a multiple rainbow effect:

1600 G.M.T.: A reddening of the horizon below a Cb. cloud which was shedding rain, bearing 070°. Sky cloudy, 5/8 covered, with numerous rain showers in sight.

1603: A bluish-green tinge was observed below the red which was ascending. To the left, bearing 060°, a dim segment of a secondary bow was seen and the sequence of colours was reversed (red on the inner edge).

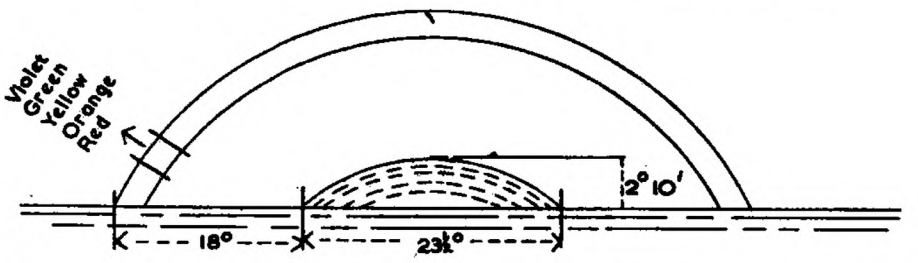
1607: The colours of the primary bow were becoming more definite: red, yellow, green and violet were distinguishable; yellow was the most brilliant.

1610: Yellow still brilliant, but violet was increasing in intensity and only the left-hand side of the bow could be defined. Altitude of highest point of primary bow was 1° 20'.

1611: Violet now most brilliant.

1612: Both secondary and primary bows now extended to form a complete arc with the violet most brilliant in the primary, and the secondary dim. In both bows the colours were brightest on the left. The bearing of the centre remained constant at 070°; altitude of highest point of primary was 2° 10';

horizontal angle subtended by primary on the horizon was 23½°; secondary was 18° above primary. The display was approaching rapidly with the rain

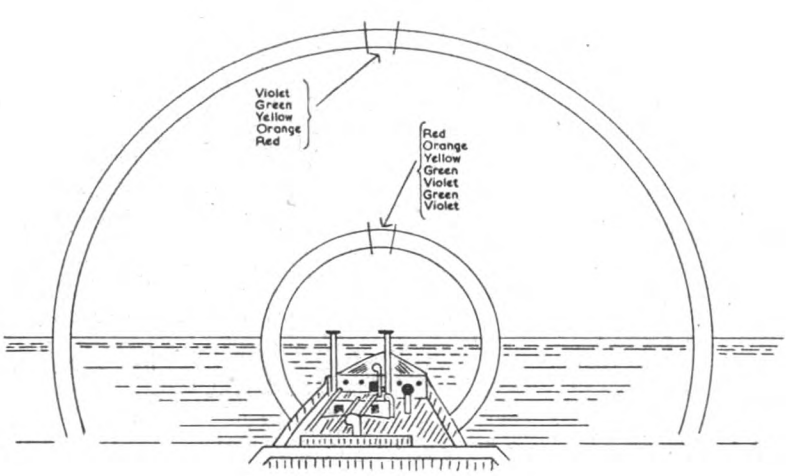


Order of colours in central arc:—Red, orange, yellow, green, violet

at an estimated distance of 1½ miles. Sun bearing 253°, altitude 40° (sun's lower limb) (see figure).

1615: Bow almost right ahead, with the lower edges curved round the ship's forecastle; an inner green ring became visible and rapidly reached equal brilliancy with rest of primary. Light rain began, then became moderate with rather scattered drops.

1616: Moderate rain falling; bows centred approximately on top of the



jack staff, visible over an arc of about 300°. Green and violet inner rings were visible and all colours were very bright (see figure).

1619: Bows disappear. Course 077°, speed 9 knots.

Position of ship: Latitude 50° 40'N., Longitude 13° 58'W.

SOLAR HALO

Mediterranean Sea

M.V. *Port Lincoln.* Captain L. Copeland. Port Said to Newcastle. Observer, Mr. B. St. J. Smith, 3rd Officer.

17th June, 1950, 1200 G.M.T. The wind freshened from the NW with Ci. and Cs. forming. By 1300 a large halo was visible, partly encircling the sun, showing three distinct colours (red, green and yellow). At 1400 a complete halo of smaller radius (22°) and width appeared, the colours

showing less distinctly than in the arc which was still visible. By 1410 both halos had disappeared. The sun's altitude was 67°.

Position of ship: Latitude 37° 10'N., Longitude 7° 09'E.

Note. The larger halo observed in part was the halo of 46° radius, which is normally more brightly coloured than the halo of 22°.

CREPUSCULAR RAYS

Lagos Pool

S.S. *Essex Trader.* Captain D. G. Evans. Observers, Mr. F. Stamps, Chief Officer, and Mr. D. Harris, 2nd Officer.

28th May, 1950. Soon after sunset the western half of the sky was divided into two distinct parts, one light and the other dark, by a vertical line rising from the position of the sun below the horizon. The light, or illuminated area of crepuscular rays was pink in colour while the shadowed area was green, almost approaching black. The shadows from this phenomenon were thrown right across the sky and appeared to converge to a point a little above the E'ly horizon. Some altocumulus castellatus was present.

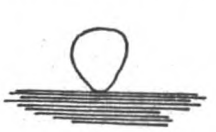
Note. At the time of the observation the sun was probably behind a mountain peak below the horizon to the westward. The darker portion of the sky would therefore be the shadow of the mountain projected on the air.

GREEN FLASH

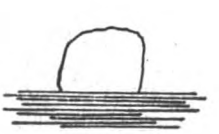
Red Sea

S.S. *British Statesman.* Captain J. R. Lumby. Abadan to Port Said. Observer, Mr. S. B. Wade, Chief Officer.

17th April, 1950. The sun was seen to be taking on a distorted appearance as it approached the horizon, the altitude at the time being about one-quarter of its diameter. The lower limb appeared to be pulled down, giving the shape of an inverted pear.



(1)

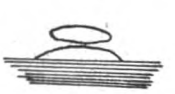


(2)

(3)

Bearing in mind the possibility of a green flash developing, I closely observed the sun through prismatic binoculars. As the sun touched the horizon it took on a squattish appearance. Sinking to half its diameter,

(4)



(5)

the whole outline was violently agitated and a cap formed from the upper limb. When about four-fifths of the diameter was below the horizon, this cap became separate from the main body and quickly took on a greenish tinge at its edges. Within a second or so the whole of this detached portion became a brilliant emerald green, then immediately disappeared, the upper limb of the sun still being visible.

Position of ship: Latitude 25° 44'N., Longitude 35° 19'E.

METEORS

Gulf of Mexico

S.S. *Clearpool.* Captain J. Whamond. Norfolk, Va., to Galveston. Observer, Mr. A. Pringle, 3rd Officer.

17th April, 1950, 0250 G.M.T. A meteor was observed to fall from an altitude of about 25° to 3° above the horizon, bearing SSW. The diameter seemed to be about one-quarter of that of the moon. The body was spherical in shape with jagged edges which were clearly visible and was bluish-white in colour. A light-green fluorescent trail was visible, in length about six times the diameter of the body.

Position of ship: Latitude 25° 20'N., Longitude 85° 33'W.

Arabian Sea

S.S. *Orbita.* Captain J. Sutherland. Hong Kong to Liverpool. Observer, Mr. G. E. Mitchell, 3rd Officer.

7th May, 1950, 1940 G.M.T. A meteor was observed in close proximity to Deneb. The duration was about three seconds, for two of which the meteor appeared motionless before tailing off towards the horizon and disappearing. No other meteors were seen during this first watch. There was no cloud.

Position of ship: Latitude 10° 48'N., Longitude 58° 57'E.

North Pacific Ocean

S.S. *Pacific Liberty.* Captain W. F. Swann. Balboa to Los Angeles. Observer, Mr. C. G. Stiff, 3rd Officer.

12th May, 1950, 0245 G.M.T. An exceptionally bright meteor was observed at an approximate altitude of 40° in close proximity to α Canis Minoris (Procyon). It burned with a brilliant yellow light, illuminating the whole area of sea and sky around the ship for about six seconds. It fell vertically downwards until its altitude was approximately 35° and then disappeared.

Position of ship: Latitude 14° 08'N., Longitude 95° 44'W.

Caribbean Sea

S.S. *Tongariro.* Captain C. P. Robinson. Colon to Curaçao. Observer, Mr. J. Camping, 3rd Officer.

17th May, 1950, 0153 G.M.T. A brilliant green meteor was observed at an approximate altitude of 20°, near α Centauri, travelling in a SW'ly direction. It left a greenish-white trail which extended for about 10°. The sky was illuminated to such an extent that the whole ship was clearly discernible. The duration of flight was three seconds, the trail remaining visible for a further 5 seconds.

Position of ship: Latitude 12° 38'N., Longitude 71° 36'W.

North Atlantic Ocean

R.M.S. *Media*. Captain D. M. Maclean, D.S.C., R.D., R.N.R. New York to Liverpool. Observer, Mr. P. Jackson, Sen. 3rd Officer.

12th June, 1950, 0345 G.M.T. A meteor of a dull red colour was observed moving slowly across the sky, bearing approx. 040°, altitude 60°, travelling in an apparent N–S direction.

As the speed increased so the intensity became greater until the meteor burst with a brilliant blue-green flash, lighting up the sky and clouds in its vicinity. Many fragments were observed scattered in all directions, leaving several trails from the position of the parent body. The main trail remained visible for three minutes. On bursting, its bearing was 150° at an altitude of about 15°. The total time of flight was about 17 seconds.

Position of ship: Latitude 42° 38'N., Longitude 42° 42'W..

LUNAR ECLIPSE

South African Waters

M.V. *Clan Maclaren*. Captain A. Redford. Dakar to Cape Town. Observer, Mr. K. Morton, 3rd Officer.

2nd April, 1950. A total eclipse of the moon was observed. It began at 1909 G.M.T. and ended at 2219, the total phase covering the period 2030 to 2059.

Position of ship: Latitude 32° 00'S., Longitude 16° 30'E.

Indian Ocean

M.V. *Gloucester*. Captain N. L. Warren. Brisbane to Aden. Observer, Mr. G. W. Wotton, 3rd Officer.

2nd April, 1950, 1909 G.M.T. A shadow began to move over the face of the moon and by 2030 the moon was totally obscured. At 2102 the shadow began to lift, but clouds soon made further observation impossible. The weather was generally cloudy with good visibility and a light NW breeze.

Position of ship: Latitude 4° 51'N., Longitude 79° 00'E.

* * *

CAUSE AND EFFECT

The following statement appeared in the " Remarks " column of a Selected Ship's logbook recently received in the Marine Branch: " Radio officer lost overboard. Unable to transmit messages."

WATERSPOUTS

BY A. H. GORDON, M.S.
(Marine Branch Meteorological Office)

PART II

In Part I (*The Marine Observer*, January, 1951), the author described some examples of the effects of waterspouts on vessels at sea. The physical and dynamical characteristics of a waterspout vortex were discussed and a possible mechanism of its formation and development given. A frequency distribution map of the occurrence of waterspouts over the oceans was shown and its implications discussed.

In Part II, printed here, correlations between waterspouts and prevailing meteorological conditions are made and the results interpreted. Conclusions are drawn concerning conditions favourable to waterspout formation.

Correlation between number of Waterspouts and various Meteorological Elements

Surface Pressure

The greatest number of waterspouts were reported within the pressure range 1010–1015 mb. The high number reported within this range may be explained by the fact that the greatest number occurs in tropical regions, where pressures of this order are most common, rather than because the formation of the spouts is particularly favoured by pressures within this range.

Waterspouts reported with pressures below 990 mb. all occurred in temperate latitudes, where they were a probable indication of instability. A considerable number of spouts have occurred with fairly high pressures, so that in many cases any instability present must be confined to low levels beneath the stable inversion layer usually associated with high pressures.

Air Temperature

The number of spouts increases with increasing temperature until the maximum is reached at 80–85°F. However, it cannot be inferred that the number of spouts reported is a direct function of temperature, as humidity and lapse rate are also important factors. The diminishing number reported at temperatures above 85°F. is obviously due to the relatively infrequent occurrence of such high temperatures over the sea. Some spouts have occurred with temperatures as low as 30–35°F.

Lapse rate is probably the most important factor for waterspout development. If the temperature is low, as in temperate regions, a high lapse rate can be established when cold air moves over a warm sea. If the temperature is high, as in the tropics, a high lapse rate can be set up from the continuous heating of the surface water by the sun.

Sea Temperature

The number and distribution of spouts reported, in relation to sea temperature, is very similar to that described in the preceding section.

Difference between Sea and Air Temperature

This element is an important criterion in an analysis of the formation of waterspouts from the available data. In the absence of any upper-air data to ascertain lapse rate and stability conditions, this temperature difference

provides a means of estimating such conditions in the shallow layer of air between the sea and the level of the ship's bridge or deck. It is quite conceivable that this shallow layer does play quite an important part in the initiation of much convectional activity.

It might appear that most waterspouts should occur where the sea-air temperature difference was greatest. Spouts do occur with high sea-air differences, but these are only a small proportion of the total. In some cases there are as many waterspouts reported for a negative as for the same positive difference. The maximum number is reported when sea and air temperatures are the same, or when the sea is 1°F. warmer than the air; almost as many are reported when the sea is 1°F. colder than the air. It is possible that, because of the tendency for ships' air temperatures to read too high because of the effect of radiation from the ship, many of the latter cases really occur when the sea is a little warmer than the air. However, since cases of waterspouts have been observed with the air as much as 9°F. warmer than the sea, it seems that they can and do occur with a stable lapse rate and even with an isothermal or inversion lapse rate in this shallow surface layer.

In cases where the sea and air are about the same temperature, and it is in such cases that a maximum number of spouts is reported, a superadiabatic* lapse rate may still exist between the sea surface and the deck level; since this difference in temperature need not be more than 0·25°F. to 0·5°F., such a small difference might not be observable in measurements of temperatures of sea and air taken aboard ship.

In cases where waterspouts have occurred when the air is warmer than the sea, the conditions favourable to their formation may be present at higher levels about which no information is available. Once formed aloft the spout could extend down to the surface. A lapse rate equal to the dry adiabatic could exist in the surface layer when the air was warmer than the sea, if there was turbulence.

Mixing Ratio of Air at Observed Temperature†

The greatest number of spouts are observed with a mixing ratio of 15 to 20 gm./kg. Mixing ratios of about this value would occur if the dry bulb was 80°F. and the wet bulb 75°F. More spouts would probably be observed with higher mixing ratios, if such high mixing ratios occurred with a greater frequency than they do.

Mixing Ratio of Air assumed saturated at Temperature of Sea Surface

The maximum number of cases occurs with a mixing ratio of 20 to 25 gm./kg. Mixing ratios of about this value would occur if the dry bulb was 80°F. and the wet bulb 80°F.

The values of mixing ratios at the surface of the sea, based on the supposition that the air there is saturated at the sea-surface temperature, may be hypothetical. As stated earlier, when the air is in turbulent motion there should be no skin layer in continuous contact with the sea surface. The air particles in contact with the sea are rising and falling and a lapse rate near to the dry adiabatic is created in this turbulent layer. The air at any time in contact with the water may not be saturated. If, however, the air has been quiet or stagnant for some time over the sea, then there will be a skin layer

*Superadiabatic—lapse rate greater than the adiabatic of 5·4°F. per 1,000 ft.
†Mixing Ratio—is expressed as grams of water vapour per kilogram of dry air.

in continuous contact with the water surface and this layer will tend to approach the temperature of the sea surface and to become saturated at that temperature. Occurrences of waterspouts are more frequent when the mixing ratio of this skin layer is unusually high. This is probable, firstly because a saturated air parcel is lighter than drier air surrounding it at the same temperature, and secondly because if an air parcel is saturated it requires a smaller lapse rate in the surrounding air to bring it into a state of instability. The condition favourable for the initiation of local unstable motion is, of course, not that the whole skin or lower layer should become unusually warm and moist, but that an isolated parcel within this layer should assume these characteristics in relation to its environment.

Difference in Mixing Ratios between Air at Observed Temperature and Air assumed saturated at Temperature of Sea Surface

The greatest number are observed with a difference varying from 3 to 7 gm./kg. A steep gradient of water vapour content near the surface would be favourable for the initiation of convection and possible subsequent waterspout formation, because of the reasons mentioned in the preceding paragraph.

The stability of the shallow surface layer of the air, as determined by the temperature and humidity lapse rates within that layer, may only partially affect the initiation of violent vertical currents. Such motion is more largely dependent on the stability of the air in layers of much greater vertical thickness. However, if conditions are suitable for instability to occur in thicker and therefore higher layers, then an exaggeration of these conditions in the properties of the shallow surface layer may intensify the situation and be the cause of " trigger " action.

Wind

In the Northern Hemisphere wind direction appears to have little effect on the frequency of waterspout occurrences. In the Southern Hemisphere, however, it seems that winds from a southerly quarter are more closely associated with their occurrence. One might have expected that winds from a northerly quarter would have shown up similarly in the Northern Hemisphere curve, but this is not the case. However, the relevant winds which have been reported are so light that a wind blowing from one direction would be unlikely to differ much in its properties from a wind blowing from another direction. The majority of cases occur with a wind of Beaufort force 2 only and the number of cases drops off rapidly for winds of successively greater forces. This bears out the conclusions reached earlier that waterspouts are most likely to form in stagnant air which has remained fairly stationary over a given area of the sea and has been modified by the sea in such a way as to become highly unstable. In the few cases where high wind forces have been reported these winds are probably a part of the effect of the waterspout itself and not a measure of the general air circulation prevailing in the area where the spout occurred.

Cloud

The number of cases of waterspouts was associated with various types of low cloud as follows: small Cu. 7; large Cu. 124; Cb. 115; large Cu. or Cb. and Sc. 117; large Cu. or Cb. and scud 25; Sc. and Ns. 20; Sc. 34; cloud type unreported 550.

The majority of cases have thus been large cumulus or cumulonimbus. The occurrence of waterspouts with these types of clouds indicates that pronounced instability to high levels must be an important factor in their formation.

The greatest number of cases occurs with only 3/10 and 2/10 of low cloud respectively. The next greatest number occurs with 10/10 of low cloud. Oddly enough six cases occurred with no low cloud at all. Cases where 10/10 of cloud have been reported may be occurrences where the ship is quite near to the waterspout and underneath a cumulonimbus cloud. On the other hand cases where only a few tenths of low cloud have been reported may be occurrences where the waterspout is observed at some distance from the ship. In such cases the spout may be underneath or extend up into the cumulonimbus cloud, which would appear as 10/10 directly underneath it.

However, the fact that cases have been reported with no low cloud indicates that vertical instability need not always extend to great heights and may in some cases only exist in a shallow layer near the sea surface. This is borne out by actual evidence. For example, on one occasion when a spout was observed with only 1/10 of small cumulus in the sky, it was noted to be small and only 6 ft. to 8 ft. high and to last for only four minutes. On this occasion sea and air were the same temperature.

Weather Phenomena

Out of all the observations, precipitation of one form or another was noted on 234 occasions, squalls on 57 occasions and lightning on 28 occasions.

Diurnal Frequency of Waterspouts

In Fig. 6 the diurnal frequency of observed cases of waterspouts has been classified into four equal periods of the day. The outstanding feature brought

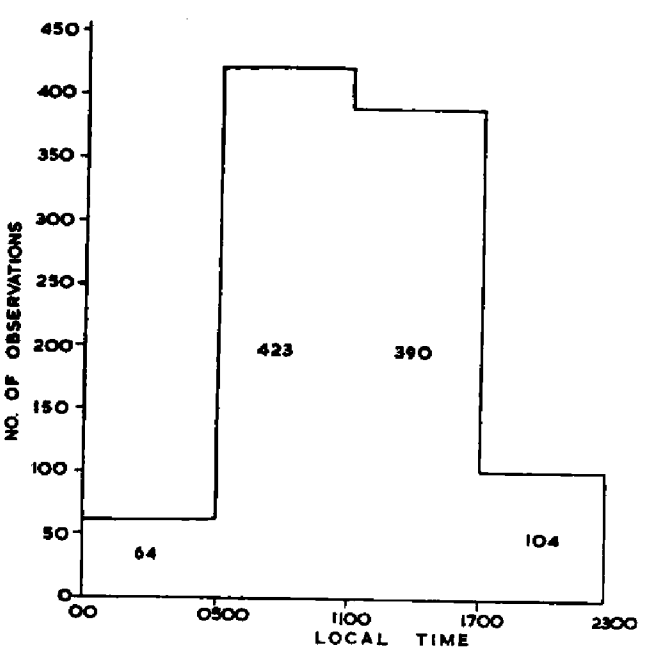


Fig. 6

out by this diagram is that relatively few waterspouts are observed during the hours of darkness, as would be expected. Although a few more cases

occurred before noon than after noon, the difference is insufficient to infer any more likelihood of waterspouts occurring before than after noon.

If darkness did not severely limit the number of waterspouts observed at night, interesting information regarding their diurnal frequency might be obtained.

Monthly Frequency of Waterspouts

The monthly frequency of waterspouts observed in the Northern and Southern Hemispheres is shown in Fig. 7. The maximum number occurs

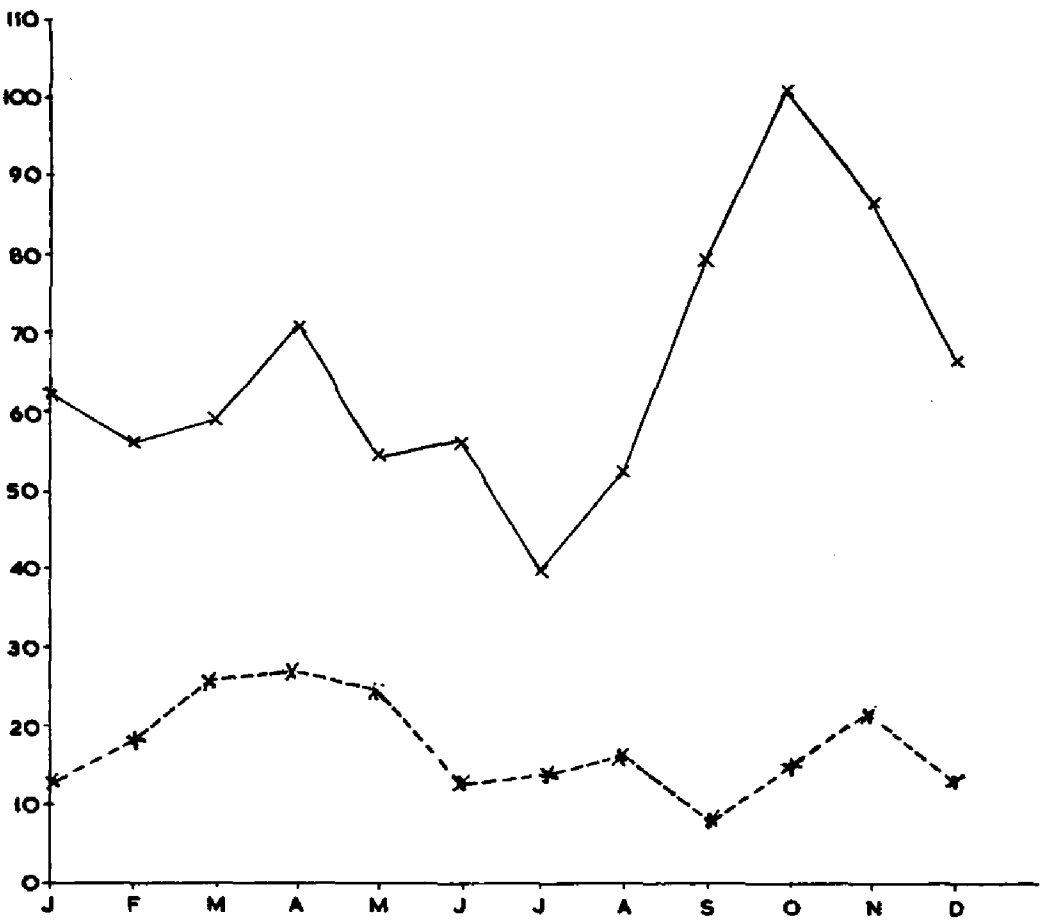


Fig. 7

in October in the Northern Hemisphere and in April, the corresponding month, in the Southern Hemisphere. The next greatest numbers occur in the correspondingly adjacent months for each hemisphere. A secondary maximum occurs in April in the Northern Hemisphere and in November in the Southern Hemisphere. The maximum frequency therefore occurs in the early autumn. It is at this time that instability over the sea becomes most highly developed. Sea temperatures are high after the summer's heating effect, while the first cold air outbreaks are commencing to blow from the polar regions.

A secondary peak of high instability might also exist in the spring months when the sea is warming up by direct heating from the sun, while the air blowing from the polar regions still retains its winter coldness. The monthly number of waterspouts agrees well with these suppositions regarding stability.

There is quite close agreement between the monthly frequencies of waterspouts and of tropical hurricanes. The instability associated with high surface sea and air temperatures, which appears favourable to the formation of the small waterspout vortex, may therefore also be the initial factor in the formation of the much larger vortex of the tropical revolving storm. The formation of a tropical hurricane may be set off by convective activity on a vast scale. Instead of the small vertical currents which cause clouds and showers, large masses of air covering hundreds of square miles may ascend in relation to their environment.

Conclusions

From a consideration of all the available data and particularly of cases of waterspouts occurring in or near the British Isles, for which upper air data is available, it is concluded that the condition that is perhaps most favourable to waterspout formation is a super dry adiabatic lapse rate in the 50 mb. layer immediately above the surface. However, this may not be an essential condition if other assisting conditions are very favourable. Additional assisting conditions, one or more of which may have to be present as well as the condition above, are:

(*a*) A conditionally unstable lapse rate to high levels.
(*b*) A sharp wind shift at the surface or aloft, as at a frontal surface.
(*c*) A discontinuity in the vertical wind velocity gradient.
(*d*) Light winds or calm conditions in the unstable surface layers.
(*e*) High sea temperatures.
(*f*) High mixing ratios of the unstable surface layer.
(*g*) Sharp horizontal fluctuations of sea and surface air temperatures.
(*h*) Sharp horizontal fluctuations of surface air mixing ratios.
(*i*) A steep lapse rate of mixing ratio in the unstable layer.

These conditions are largely properties of the air mass concerned. The type of pressure distribution and the dynamical properties of the circulation are not such important factors, although there is more likelihood of waterspouts occurring in regions of convergence where wind discontinuities are liable to exist or where local vorticity is high.

Forecasting of Waterspouts

The forecasting of waterspouts has not been seriously attempted in the past, because they have been considered to be isolated phenomena, only occurring at infrequent intervals, mainly in the tropics. It is open to some question, however, whether they are so infrequent as hitherto supposed, even in temperate latitudes. They form and disappear in a short time, and unless the observer is vigilant they may be missed. They cannot normally be seen at night so that very little idea of their frequency during the hours of darkness can be obtained.

These phenomena are undoubtedly dangerous to small ships and to aircraft in flight. In the latter case, if they are not seen, as during the night or while flying through cloud, damage to or loss of the aircraft and its occupants might be entailed if a collision with a waterspout column should result. In favourable situations many may occur together. For example, on

the 12th February, 1888, at 35°N., 74° 45'W., the British S.S. *Earnmoor* reported that more than 30 waterspouts passed the ship, and near the same locality many more were reported by other vessels. On the 14th of the following March, 20 or 30 spouts were observed near that vicinity by the S.S. *Faedrelandet*. In 3 per cent of cases studied by the U.S. Weather Bureau more than 15 were counted at once.

Given the conditions favourable to their formation, it might be possible to forecast the risk element of their formation. It would be extremely difficult, however, for any degree of precision to be given in such a forecast, which could only serve as a rough guide.

THE INSTITUTE OF NAVIGATION

Among the subjects discussed during November to January at the Institute of Navigation, which would be of interest to readers of this magazine, are included " Surface Navigation in High Latitudes ", " The Sensory Basis of Bird Navigation " and " Submarine Navigation ".

" Surface Navigation in High Latitudes ", which was discussed on 17th November, included two papers, SPECIAL PROBLEMS IN POLAR REGIONS, by Lieut.-Commander J. D. Moore, R.N., and COMPASS PROBLEMS, by Commander A. V. Thomas, R.N.

In the former paper the author covered a very wide range, including the physical difficulties of obtaining sights, the particular trigonometrical problems connected with the working out of those sights, ice navigation, the variable and uncertain currents and, in particular, the difficult meteorological conditions which are encountered in far northern waters. As one listened to the paper one felt a growing admiration for the people who voluntarily venture into Arctic or Antarctic waters and face the difficulties and hardships which one encounters there. The author brought home to the audience the enormous role that meteorology plays, as far as the navigator is concerned, in such waters. In addition to the frequent storms which one encounters, in summer and winter, and the low temperature, there is the oft recurring problem of low visibility and overcast skies. Even when the navigator can get a sight, his physical problem of taking it is quite difficult in winter-time in these waters; for example, on occasions the hands cannot be uncovered for more than a few seconds due to risk of frostbite, and everybody knows how awkward it is to handle a sextant with thick gloves on. The value of electronic aids to the navigator was very vividly brought home. Although one feels that such aids (Loran, Consol, Decca, etc.) are of inestimable aid, there is no doubt that, in these waters particularly, the personal skill, ingenuity and alertness of the navigator will frequently be called upon. The value of radar and, indeed, of asdic for the detection of ice was emphasised, and the author referred to the particular value of the asdic when endeavouring to locate a relatively " soft " passage through pack-ice. The value of the echo sounder and, in fact, of our old and trusted friends " lead. log and lookout " in far northern waters, as everywhere else, was mentioned.

In the second paper Commander Thomas, who obviously had his problem at his finger tips, had his audience rather wondering if there was any compass, gyro or magnetic, which would be any use whatever in very high latitudes, by

the time he had finished his talk. Those of us who had thought that the gyro compass was almost infallibly the mariner's friend had a rather rude awakening, and one rather wondered whether, perhaps, our older friend the magnetic compass, was not the best bet after all. Both types of compass have their limitations in very high latitudes—the magnetic compass due to loss of directive force making it so very sluggish, and the gyro compass due to the enormous latitude correction and to the fact that its very principle as a compass breaks down when one gets into such latitudes. It is perhaps fortunate for the polar navigator that so much of the polar regions themselves are ice covered that ships cannot get beyond a certain latitude in the Arctic or Antarctic.

The interest that these two papers aroused was shown by the lively discussion which followed, in which more than one speaker with practical polar experience took part. Listening to the papers and to the discussion, one's mind went back to the Russian convoys and the Iceland patrol during the last war, to the voyages of Scott and Shackleton and the old-time whalers and sealers, to Franklin and Hudson, to the drift of the *Fram* and other ships across the Arctic circle, and to the flight of the R.A.F. aircraft " Aries " to accurately " fix " the North Magnetic Pole. And one realised how all these voyages have painstakingly built up our knowledge about the high latitudes of the oceans, and in combination with scientific research and invention have helped to ease the problem of the modern navigator who ventures into these waters.

At the meeting on 5th January, Dr. G. V. T. Matthews, Department of Zoology, Cambridge, gave an unusual and interesting talk entitled THE SENSORY BASIS OF BIRD NAVIGATION, in which he discussed not only mass migration of birds but individual flights by carrier pigeons, ducks, geese and certain sea birds. He discussed, under two headings, the various theories which have been advanced as to how birds find their way about over such large distances as they are known to fly, and how they manage to be so accurate in their navigation. He mentioned, for example, the transoceanic flights of the Alaskan golden plover, which migrates a distance of about 2,000 miles to Hawaii, and the great shearwater's annual visit to its mating place on lonely Tristan da Cunha from widely scattered parts of the Atlantic. On the other side of the picture he discussed the racing pigeon, which is trained by man and yet man does not know on what principle the pigeon sets his course for home.

Among the theories he discussed were:

(*a*) A random search by the birds for a known landmark.

(*b*) A systematic search.

(*c*) A sensitivity to the infra-red rays of the atmosphere.

(*d*) A sensitivity to the electro-magnetic waves in the earth's magnetic field.

(*e*) A sensitivity to the acceleration variations imposed upon the bird in flight.

(*f*) A magnetic sensitivity, whereby the bird would need to act almost as though it had a compass or lodestone in its makeup.

(*g*) A sensitivity to the decrease in gravitational pull, due to variation in latitude.

(*h*) The use of a " grid " system, involving change of latitude and variation in the earth's deflective force (Coriolis force) and the isolines of the vertical component of the earth's magnetic field.

(*i*) Variations in Coriolis force alone.

(*j*) A simplified version of solar navigation, whereby the bird picked out his orientation from the direction of sunrise and sunset and his latitude from the sun's altitude.

Dr. Matthews ably disposed of each theory in turn, and in the end it seems he came to the conclusion that birds probably navigate by a combination of circumstances, in which sight and commonsense and familiarity play a large part. Certain mysteries, however, connected with the flight of racing pigeons, and homing pigeons generally, were certainly not explained, for when such birds are carried in a crate by train it is extremely difficult to think out how they can possibly pick up their orientation for their return flight.

During his talk he mentioned that young geese usually do their first migration with their parents. He described experiments which had been made to gain information about bird navigation, including ringing of the birds, following them with aircraft and even securing tiny self-recording instruments on the birds. He mentioned that if certain birds are taken, during their migration, and displaced far on one side of their original line of migration and then released, they continue to migrate in the same compass direction.

During the discussion certain speakers suggested that climatology and, indeed, such meteorological aspects as windspeed and direction and atmospheric pressure—particularly the " permanent " wind and pressure systems—might well play quite a part in this problem. The lecturer pointed out that birds seemed generally to forestall climatological change and start their migration well before any great change in temperature occurred in any given season. Perhaps it was more a lack of their basic food as the season advanced than change of temperature which urged them to begin their migration voyages.

On 19th January, Lieut.-Commander Satow, R.N., formerly navigating officer of H.M. submarine *Talent*, gave a very detailed and admirably illustrated account of the problems of the " submariner " when navigating his vessel submerged. Before the lecture a member of the Institute was heard to remark, " We won't hear much about meteorology tonight ", but as the lecture unfolded it was interesting and, indeed, illuminating to learn how much meteorology does play its part in the underwater problems of the submariner. The whole lecture brought home a few more instances of the practical value of co-operation between oceanographers and meteorologists.

Commander Satow stressed the effect which atmospheric conditions have upon ocean currents and the analogy between atmospheric and oceanic circulation generally. He went into details about variation in direction and force of currents and tides at the surface and at various depths, and the necessity of research into such problems. The navigational value to the submariner of the echo sounder and the asdic was stressed, and the lecturer pointed out that there was really no electronic aid to navigation which was of any real value to the submariner when submerged.

He described some very interesting experiments into gravitational variations in the Channel in which his submarine had taken part. Ingenious methods of accurate navigation for taking these observations included the use of the taut wire apparatus through a special gland in the submarine's hull, and surfacing at the end of each run to check the position by Decca. During the course of these experiments much information was obtained by variations in the flow of the tide at various depths.

Two very interesting meteorological phenomena which were discovered during the course of these experiments were:

(*a*) The existence of a very great humidity gradient close to the surface of the water in calm conditions which caused freak radar effects.

(*b*) In foggy conditions, when the tide is flowing into shoal water, upwelling occurs on the edge of the bank, and the resulting lowering of the temperatures causes a local thickening of the fog close to the water surface.

The general impression one had from the lecture was that the task of the navigator in a submerged submarine was an extremely difficult one, but that practical experience and scientific investigation was doing quite a lot to ease his problem.

C. E. N. F.

THE CHALLENGER SOCIETY

At a meeting of the Challenger Society on 17th January, Mr. R. H. Clarke, M.A., and Mr. R. I. Currie, B.Sc., read a very interesting paper on OCEANOGRAPHY AND WHALE MARKING IN SOUTH AFRICAN WATERS: THE RECENT VOYAGE OF THE *William Scoresby*. Readers of this magazine will know that the *William Scoresby* is the smaller of the two research vessels formerly used by the Discovery Committee for whale marking and now working for the National Institute of Oceanography.

Mr. Clarke first of all gave a general description of the recent voyage of the ship, which began on 28th January and terminated on 18th November, 1950. A lot of the voyage was spent investigating the Benguela and Agulhas Currents, and a number of oceanographical observations down to the bottom were taken in both currents. The great strength of the Benguela Current on the edge of the continental shelf was very forcibly brought home when the expedition endeavoured to use trawls and fish traps in order to secure specimens. They got over this difficulty, however, by fishing with deep lines.

In the Agulhas Current, probably the most interesting fact was the great productivity therein; the number of seals which live on the islands off the coast is truly remarkable, and the whole area seems to abound in fish. A high mortality of fish occurs at certain times, the reason of which is not fully known. It was suggested that it may be somewhat akin to that which causes similar mortalities off the coast of Peru at certain seasons of the year.

The expedition hoped to go from Mauritius to Australia and make observations en route, but having started on this passage they were forced back due to a succession of strong south-easterly gales and, having abandoned that part of the voyage, carried out further observations off the South African coast. Mr. Clarke paid tribute to the fine work done by all hands during this voyage, but pointed out that the expedition had not yet had time to work up their results.

Mr Currie then gave a more detailed description of the observations they had made into the Benguela and Agulhas Currents, and there seems little doubt that the expedition learned a lot both about the vertical profile of these currents as concerns temperature, density and rate of flow; the horizontal temperature gradient and, what is more important to the navigator, the vagaries in the rate and direction of flow at the surface. The expedition confirmed, for example, that the Agulhas Current in certain parts thereof flows in very variable directions.

Mr. Clarke then showed an excellent film which vividly described the fishing experiments which they had made. The difficulties of streaming a large fish trap from such a small ship was emphasised and some fine shots were shown of giant rays, sharks and other deep-sea fish being hove aboard. There seems little doubt that this expedition has considerable practical value, both from the study of fish population in this area, and with regard to the vagaries of the currents.

At a meeting of the Society on 19th January, Dr. G. E. R. Deacon, F.R.S., described the work, aims and objects of the recently formed National Institute of Oceanography. He pointed out that the Institute was formed as a result of consultation between various influential bodies interested in oceanography, including the Royal Society, Admiralty and the Ministry of Agriculture and Fisheries, and various private oceanographical institutes of the country as well as the universities.

He emphasised that the work of this Institute would certainly not be to duplicate marine biological and other such work already being done by other organisations. It would endeavour to restrict itself to certain outstanding problems which urgently needed solving, and on which little had been done up to the present. One subject in which he said that the Institute was extremely interested was that of the relationship between meteorology and oceanography—in other words, to investigate the effect that varying atmospheric conditions had upon the oceans, both at the surface and down to considerable depths. He pointed out that the Institute's two vessels *Discovery II* and *William Scoresby* were already engaged on practical oceanographical work, and that they proposed setting up a laboratory for working out the results of the work of these ships, as well as the results of other investigations, in the near future.

In a paper entitled THE INTERACTION BETWEEN THE ATMOSPHERE AND THE OCEAN, Mr. Charnock, of the National Institute of Oceanography, went into more detail about the necessity of research being made into the relationship between meteorology and oceanography. He pointed out that until we had more knowledge of this we could not advance very far in our oceanographical knowledge, because there was no doubt whatever that atmosphere and the winds largely controlled the motions and temperatures of the oceans; and the oceans, in their turn, had a similar effect upon the atmosphere, and thus one had a sort of " closed cycle ", the effect of one upon the other being complementary. His remarks, in general, certainly emphasised the necessity of meteorologists and oceanographers getting together, for there is little doubt that, for the meteorologist, oceanographical research is of very great value. It seems that until more detailed studies have been made about meteorology over the oceans, we cannot advance very far in the direction of long-term forecasting.

Mr. Charnock gave details of some experiments which the National Institute had been making in conjunction with the Imperial College of Science into variability of wind in the lower layers of the atmosphere, up to 1,000 ft. These experiments have been made off the Scilly Islands, observers with theodolites being stationed at selected points on various islands and balloons filled with hydrogen being released from a boat to windward. Preliminary investigation of the results of these experiments shows that there is considerable variability in the wind structure at various heights within these layers.

Mr. R. H. Clarke then showed a vivid and exciting film illustrating the open boat whaling which is still carried out off the Azores, using similar methods to those used in the days of Moby Dick and before. The Azores whalers use boats of about 30 ft. long, which they can either pull or sail. When under sail and in pursuit of a whale they use paddles as well. The harpoon they use is thrown by hand, and although of ancient basic design, has an ingenious patent barb at the head which tends to prevent it being withdrawn from the whale; it has a manilla line which is coiled down in two tubs to ensure it runs out without kinking. The whales are sighted from the cliffs by observers with binoculars. The boats are then towed out by motor launches to the vicinity; it is only the sperm whale that these whalers pursue. The actual pursuit and harpooning of the whales always take place with the boats under sail, the harpoon man standing in the bow of the boat. The day's " catch " is towed in to the shore by motor launches, the flensing and boiling down of blubber being done in a primitive slipway ashore. As one watched the film one realised what fine seamen and expert fishermen these Portuguese must be, and that even if they are poor their life is full of interest and excitement. At the same time they have many compensations, for whaling must be an infinitely pleasanter occupation in the warm waters of the Azores than in the inhospitable Antarctic.

C. E. N. F.

SOUTHERN ICE REPORTS

During the year 1950

APRIL

Date	Position		Description	Remarks
	Latitude	Longitude		
	° ′	° ′		
			S.V. *John Biscoe*	
11	62 36S	59 55W	Bergs.	Five small tabular bergs visible.
	61 58S	59 26W	Bergs.	Five small bergs N of Nelson Strait.
			S.S. *Thule*	
2	53 45S	27 30W	Bergs	Several icebergs observed one to three miles apart.
4	51 20S	20 43W	Bergs	Several small bergs.

May and June. No reports received.

Reports of Southern Ice for April, May and June, 1949, will be found in *The Marine Observer*, Vol. XX, No. 148, page 104.

" METHOP "

BY J. B. WALLACE

(Second Officer in O.W.S. *Weather Observer*)

I recently spent a very interesting three days with the R.A.F. at Kinloss, the primary object being to travel in an R.A.F. aircraft during a " methop " (air/sea rescue exercise) with an Ocean Weather Ship. I found the hospitality very warm, the things of interest many and varied, and that a genuine attempt is made to " put you in the picture " with regard to R.A.F. as well as " methop " procedure.

The trip from Greenock to Kinloss is unforgettable; you pass through some of the finest scenery in Scotland, via Stirling, Perth, Pitlochry, along the River Spey to Aviemore and through the Cairngorm Mountains till you arrive at Forres, your destination. A car awaits your arrival, an aircraftman jumps out smartly, salutes and drives you off on the three-mile trip to Kinloss air station.

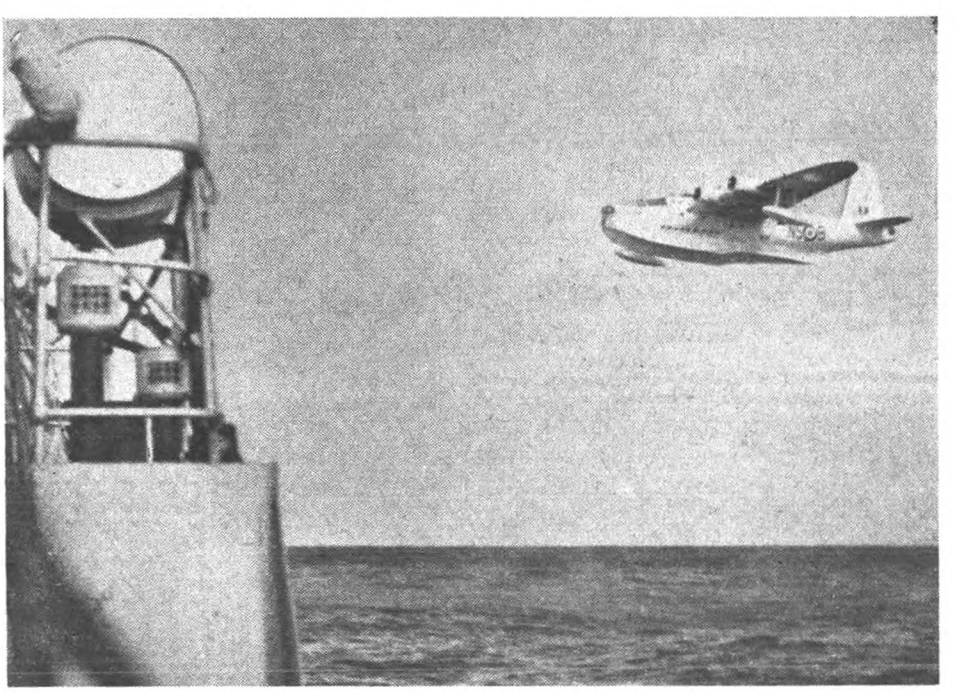
[*News Chronicle*

Photograph of O.W.S. *Weather Observer* taken on a " methop " air/sea rescue exercise, 9th January, 1949.

Our flight was scheduled for " take off " at 0430 hours, so at 0200 I was called, and in half an hour was in the briefing room. The forecaster gave us a comprehensive account of the weather conditions we should expect during the flight. An informal discussion followed till about 0300 and the briefing was over. Before leaving the briefing room I had to sign a form exonerating the R.A.F. from the responsibility of my person ; this is called " signing the blood form."

After breakfast I was taken to a store and issued with equipment consisting of: one helmet, flying; one harness, parachute; one parachute, personnel; one life-jacket, Mae West; also one bar of chocolate and one tube of boiled sweets (consumable). After this nothing remained to do but board the aircraft, a Lancaster, and stand by for " take off ".

My position was in the tail and by an observation window and looking forward. This gave me a good view of the crew at work. Slowly we taxied to position at the head of the runway and finally at 0429 word came by R/T from control tower that we had permission to proceed to station " Jig ". The four engines revved up and the aircraft started to bump down the runway, increasing speed at every second. At this stage of the proceedings everyone is classed as ballast and no one must move, for a sudden movement of weight, especially at the stern, will upset the stability, and no one wants that to happen. In a few minutes we were flying over the mountains at 8,000 ft., and before I could drink a cup of tea we were over Tiree flying at 2,000 ft. and, as the cloud base lowered, we did the rest of the trip at 400 ft. This



A Sunderland flying-boat on a " methop " air/sea rescue exercise to an ocean weather ship

was just as the forecaster had said at the briefing, in fact it almost seemed as though the met. officer had been out and had a look just before briefing time. His forecast was 100 per cent accurate.

The perfect co-ordination between pilot and crew was a treat to listen to on the " intercom ", and everything went like clockwork. Shortly after 0800 the weather ship's beacon was picked up, then R/T contact was made; we homed on the ship and at 0820 she came into view dead ahead. Our navigation had checked perfectly with the weather ship's. We circled the ship twice and dropped the mail which I had brought with me from the base at Greenock. The pilot let me say a few words on the R/T to the weather ship, we circled once more and set our course for home, the whole operation taking about 10 minutes.

The homeward journey was uneventful, except that we had to drop quickly through an ice layer at 5,000 ft. over the airfield. This made it uncomfortable as our eardrums, accustomed to the high level, ached as we quickly lost altitude. The trick to relieve this is to hold your nose, keep your mouth closed and blow as hard as you can. A few minutes later we were safely landed and the aircraft was pulled stern foremost into a hangar by a tractor for the routine overhaul.

After lunch the navigator and myself had a long and interesting discussion about navigation and navigational aids which took us to the various instructional sections of the station, a very interesting experience indeed. I also had an opportunity to discuss " Methop " procedure with the pilot and signalman and many of the points were clarified so that now we are familiar with each other's difficulties, all in all giving a much clearer understanding between aircraft and weather ship.

NATIONAL OCEANOGRAPHIC COUNCIL

His Majesty The King has been pleased to approve the grant of a Royal Charter incorporating a National Oceanographic Council with the object of advancing the science of oceanography in all its aspects. The Council will be the governing body of the National Institute of Oceanography.

The Council, which will be under the chairmanship of the Civil Lord of the Admiralty, will consists of 32 members representative of Government departments, the learned societies, the universities of the United Kingdom, and other organisations interested in physical and biological oceanography and in the sciences or branches of knowledge connected therewith. Among these members are representatives of the Governments of Australia, New Zealand and Ceylon, who are also giving generous financial assistance, and it is hoped that the work of the National Institute of Oceanography will in due course win support from the Governments of other countries of the Commonwealth.

The National Institute of Oceanography has been in existence since 1st April, 1949, under the aegis of the Admiralty, and under the management of a provisional Executive Committee. Sir Frederick Brundrett, K.B.E., C.B., B.A., Chief of the Royal Naval Scientific Service, was the chairman of this committee until his recent appointment to the Ministry of Defence. He has been succeeded by Mr. W. R. J. Cook, M.Sc., who has taken his place as Chief of the Royal Naval Scientific Service.

The Director of the National Institute of Oceanography is Dr. G. E. R. Deacon, D.Sc., F.R.S.

The work of the National Institute of Oceanography will be of fundamental nature and world-wide in its scope. It will be concerned with a number of immediate problems, bearing mainly on navigation and natural resources of the oceans, but the chief object will be the basic application of mathematics, physics, biology and other sciences toward the clarification of the natural processes which govern the distribution of physical properties, water movements and plant and animal populations in the oceans. Particular attention will be paid to the interaction between the oceans and the atmosphere. It is

expected that the work will add to the value of earlier observations, and complement that of laboratories devoted to Fishery Research and Marine Biology. The staff will be composed largely of specialists in one or more of the pure sciences, and will include experienced development engineers so that full advantage can be taken of recent advances in scientific and technical equipment and methods.

The Institute is continuing the work of the oceanographical group of the Royal Naval Scientific Service, best known for recent contributions to knowledge of the generation and propagation of ocean waves and swell, and of the " Discovery Investigations ", famous since 1926 for oceanographical work, particularly with reference to whales and other natural resources of the Southern Ocean.

The Royal Research Ships *Discovery II* and *William Scoresby* have been purchased, refitted and provided with modern equipment for physical and biological work at sea.

The *Discovery II* sailed in May for a voyage of about 20 months in the Mediterranean, Indian Ocean, Australian and New Zealand waters and the Antarctic. The *William Scoresby* sailed in January for the South Atlantic and the Indian Ocean ; she is now on her return journey, carrying out research work in the Benguela current and marking whales, and is expected to arrive in England early in November.

One of the aims of the National Institute of Oceanography will be to provide facilities which will attract academic workers to study marine problems, especially marine physical problems, for which the facilities are for the most part too expensive for a laboratory which is not specially devoted to marine investigations.

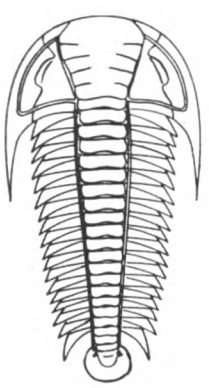
The head office of the National Oceanographic Council and the National Institute of Oceanography is temporarily at the Admiralty, Queen Anne's Mansions, London, S.W.1. The Secretary is Captain (S) R. H. G. Franklin, R.N. The permanent location of the National Institute of Oceanography, where it is hoped to centralise the activities, will be a matter for decision by the Council.

OCEANS THROUGH THE AGES

BY C. E. P. BROOKS, I.S.O., D.SC.

Dr. Brooks, formerly an Assistant Director of the Meteorological Office in charge of the Climatological Division, is the author of *Climate through the Ages* and many other books on climatology.

The origin of the oceans is wrapped in mystery. It may be supposed that when the earth first solidified, its surface was too hot for water to exist, but it soon cooled and torrential boiling rain filled all the hollows. Some cosmologists think that the first ocean covered the whole world, but it is more likely that the higher folds of land protruded as bare rocky surfaces. Various lines of reasoning show that this happened nearly 3,000,000,000 years ago. The first oceans may have consisted of fresh water, but salts would soon be washed out of the bare rock surfaces, and by the time a mere 100,000,000 years had elapsed the oceans were probably almost as salt as they are today. The rivers are always carrying salt to the sea, but this is balanced by salt left in lagoons or carried inland by the winds. But although the oceans may not have changed much in composition, their shape and depth have been in constant flux. This is shown by the rocks, containing remains of marine animals, now found in the heart of the continents and on the summits of the loftiest mountains. These changes of land and sea distribution have profoundly changed the ocean currents and through them the climates of the whole world.



Trilobite
(Cambrian era)

It is not until the Cambrian period, some 500,000,000 years ago, that we can form a real picture of the life of the oceans. At the beginning of that epoch the seas were rather cold and the fauna poor, but by the end of the Cambrian, about 420,000,000 years ago, we find a rich fauna, some forms of which, such as the famous trilobites, are like nothing living. Taken as a whole, the available evidence of sea life in that era suggests mild equable weather. There is little trace of climatic zones and open seas probably extended right to the poles. The shores of the oceans were desert, for land plants did not yet exist.

Similar mild conditions prevailed for most of geological time—roughly nine-tenths. The oceans were extensive but rather shallow, and the lands, especially in middle and high latitudes, consisted of groups of islands rather than the extensive continents we know to-day. Such a geographical situation is the most favourable possible for warming the polar regions, because it allows free influx of warm currents. In the Jurassic, for example, about 150,000,000 years ago, which was probably the warmest of all the geological periods, in place of the present Gulf Stream there were three great currents flowing into the Arctic Ocean. The shores of this ocean were warm temperate; there was no floating ice, and hence there were no cold return currents, the cooled water merely sank below the surface and flowed quietly back to the Equator at the bottom of the oceans. We will come back to the climate of these warm periods later.

ERAS	PERIODS AND SYSTEMS	DERIVATION OF NAMES
CAINOZOIC *Kainos* or *Cenos* = recent; *Zoe* = life (Recent life)	QUATERNARY*	
	Recent or Holocene	*Holos* = complete
	Glacial or Pleistocene	*Pleiston* = most
	TERTIARY*	"cene" from Kainos = recent
	Pliocene	*Pleion* = more
	Miocene	*Meion* = less
	Oligocene	*Oligos* = few
	Eocene	*Eos* = dawn
		The above terms refer to the proportions of modern shells occurring as fossils in each sub-system
MESOZOIC *Mesos* = middle (Mediæval life)	CRETACEOUS	*Creta* = chalk
	JURASSIC	*Jura* Mountains
	TRIASSIC	*Threefold* division in Germany
	NEW RED SANDSTONE	
PALÆOZOIC *Palaios* = ancient (Ancient life)	PERMIAN	*Permia*, anc. kingdom E. of Volga
	CARBONIFEROUS	*Coal-bearing*
	DEVONIAN or OLD RED SANDSTONE	*Devon* (marine sediments) (Land sediments of same period)
	SILURIAN	*Silures*, anc. tribe of Welsh borders
	ORDOVICIAN	*Ordovices*, anc. tribe, N. Wales
	CAMBRIAN	*Cambria* = Wales

PRE-CAMBRIAN ERAS:
PROTEROZOIC
ARCHÆOZOIC
EOZOIC

Sometimes described as:
Proteros = Earlier
Archæos = Primeval
Eos = Dawn
The term "Archæan" refers to the oldest Pre-Cambrian crystalline rocks of a given region

UNRECORDED INTERVAL (duration unknown)

ORIGIN OF THE EARTH

*In 1760 strata were classified as Primitive (crystalline), Secondary (consolidated) and Tertiary (loose). By an extension of this nomenclature, the period in which we are now living is called the Quaternary. The Mesozoic era is still sometimes referred to by the term "Secondary".

TIME SCALE

	MAXIMUM KNOWN THICKNESSES OF STRATA IN FEET	APPROXIMATE DATE IN YEARS OF BEGINNING OF PERIOD	DISTINCTIVE LIFE
Recent	4,000	25,000	Modern Man
Pleistocene		1,000,000	Stone Age Man
Pliocene	13,000	15,000,000	Mammals and Flowering Plants
Miocene	21,000	35,000,000	
Oligocene	15,000	50,000,000	
Eocene	14,000	70,000,000	
Cretaceous	64,000	120,000,000	Reptiles and Corals
Jurassic	20,000	150,000,000	
Triassic	25,000	190,000,000	
Permian	13,000	220,000,000	Amphibians and Primitive Plants
Carboniferous	40,000	280,000,000	
Devonian or Old Red Sandstone	37,000	320,000,000	Fishes
Silurian	15,000	350,000,000	
Ordovician	40,000	400,000,000	Invertebrates First appearance of abundant fossils
Cambrian	40,000	500,000,000	
Proterozoic	Unknown in detail but immensely great	At least 1,750,000,000	Scanty remains of Sponges and Seaweeds
Archæozoic			No direct fossil evidence of life
Eozoic			
Unrecorded Interval			
Origin of the Earth		About 3,000,000,000	

This table is taken from *Principles of Physical Geology* by Arthur Holmes with the permission of Thomas Nelson & Sons, Ltd.

At intervals of about 250,000,000 years this idyllic climate was rudely interrupted. The earth's crust underwent a spasm of folding, earthquakes and volcanoes. The floor of the ocean was bent downwards into great troughs, into which the ocean receded, while at the same time the continents were enlarged and bent upwards into great mountain ranges. The seas became narrower and the ocean currents were blocked by ridges of land thrown up across their path. Remains of one such ridge, the Wyville-Thomson, dating from the last period of disturbance, which partly shut out the Gulf Stream, still runs south-eastwards from Greenland. As the polar oceans cooled, floating ice appeared on them, and at the same time glaciers formed on the mountains and spread downwards to build great ice-sheets which calved icebergs into the seas, cooling them still further. These were the great Ice Ages, in the last of which we are living today. After the period of mountain building was over, frost, glaciers and rivers steadily wore away the mountains until they were reduced to mere stumps; the ice melted and the world settled down once more to a period of warm climate.

Let us try to reconstruct the ocean weather of a warm period such as the Jurassic. The first point in which it differed from the present was the general slowing down of the atmospheric circulation. The temperature gradient between poles and Equator was much less than at present—the Equatorial seas may have been warmer by 5°F., but the Arctic Ocean was warmer by something like 40°F. In the Jurassic the site of Oxfordshire was a group of coral islands, and the sea temperature has been put at 60°F. or over. Consequently the strength of the atmospheric circulation must have been greatly reduced; no doubt the north-east trades still blew, but were probably no stronger than a gentle breeze. The second point is that, owing to the absence of ice in the Arctic there was no true polar front. There must have been occasional depressions, since these are a necessary part of the circulation, but they were probably few and shallow, and mostly confined to relatively high latitudes. There is evidence in the salt deposits and desert sands of middle northern latitudes that the sub-tropical anticyclones extended further north than now. The difference of climate was greatest in polar regions, however. In place of the floating ice and blizzards there was an open sea which was probably occupied by an almost permanent low-pressure area—a combination of the Icelandic and Aleutian lows. Winds were mainly light south-westerly and there was a good deal of drizzle, low cloud and fog, which helped the warm ocean currents to maintain temperature above freezing during the long Arctic night.

Another warm period in Europe came early in the Tertiary period, roughly 50,000,000 years ago. At this time south-east England was the site of a warm, muddy sea with swampy shores, in which was deposited the sticky clay which forms the basis of much of London—the famous London clay. A wide precursor of the Mediterranean, the Tethys Sea, opened at one end into the North Atlantic and at the other into the tropical seas of India and the East Indies, and a warm current spread tropical evergreens along its shores. The mean annual temperature of London was about 70°F., and a feature of the vegetation was the Nipa palm, now growing in the Malayan swamps. An equally rich flora, but of temperate instead of tropical aspect, spread round the North Pole as far as 70°N. latitude.

Towards the end of the Tertiary period, as the land rose and access to the Arctic Ocean became more restricted, the seas began to cool.

The Greenland and Antarctic icecaps began to form 10–15,000,000 years ago, but for some time Europe and North America remained ice-free except possibly for small mountain glaciers. About 1,000,000 years ago, however, ice-sheets like those of Greenland and the Antarctic began to spread out from centres in Scandinavia, Quebec, Labrador and the Western Cordilleras. At the same time glaciers advanced down the slopes of the Alps, Pyrenees, Himalayas and other mountain ranges, and even formed on the high peaks of Equatorial Africa, and thus began the Quaternary Ice Age. The most rapid cooling began when the ice-sheets reached the sea and calved glaciers; then a wave of glaciation spread over the world and every summit of any height bore its cap of ice. The glaciers and ice-sheets oscillated widely; four times they spread over a large part of the temperate regions, as far as 40°N in North America and 50°N in Europe, and four times they retreated. So great was the volume of ice that sea level over the whole world was lowered by nearly 300 ft. The periods between the glacial advances are known as "interglacials" and closely resembled the present (at their best they were even a little warmer); all the evidence suggests that we are

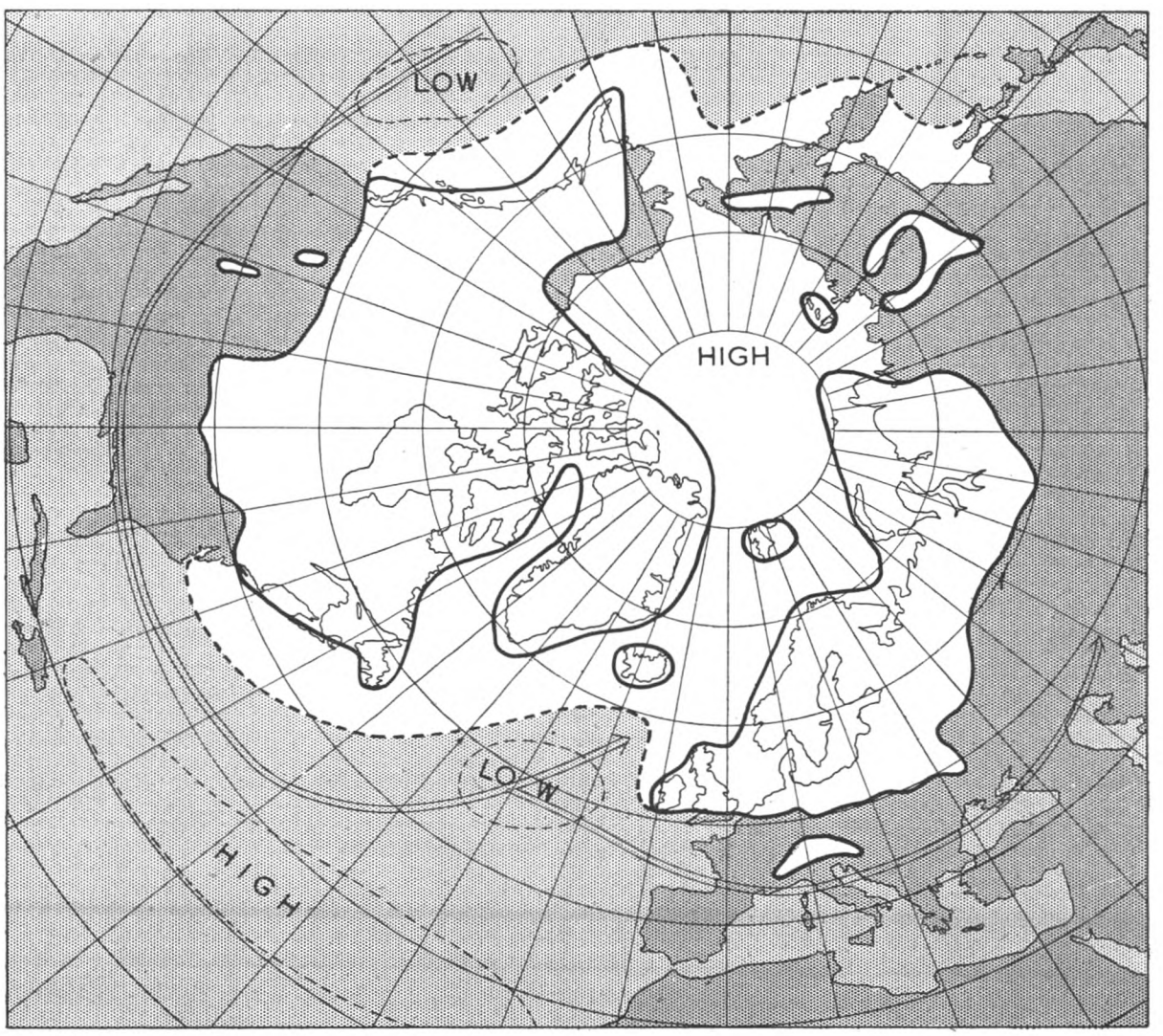


Fig. 1
Extent of ice in Northern Hemisphere during maximum glaciation in Quaternary Ice Age

now living in an interglacial period, and that at some unknown time thousands of years hence the ice is due to spread out again So far, the Quaternary Ice Age has lasted a mere 1,000,000 years or so, but the Permo-Carboniferous Ice Age, which we will discuss now, lasted about 50,000,000 years and ended about 220,000,000 years ago.

Fig 1 shows a sketch map of part of the Northern Hemisphere at the maximum of glaciation during this ice age. The area enclosed by the thick black contours was covered by ice-sheets or large glaciers. The unshaded sea areas, enclosed by pecked line, show those parts of the ocean which may reasonably be supposed to have been covered by floating ice-sheets or drift-ice. This is naturally more speculative than the map of land ice, but there is some support in the Atlantic region in the ice-borne material found on the ocean floor. The ice surface is assumed to have been the site of a large, irregular glacial anticyclone which probably consisted of several separate rather unstable centres. The high-pressure area is assumed to have driven the Icelandic low south-eastwards, with a corresponding southward shifting of the narrowed and weakened Bermuda-Azores anticyclone. The double arrow is a generalisation of the main storm track, which skirted the ice-covered area, but the Gulf Stream seems to have kept a channel up the Norwegian coast more or less permanently open, and a branch of the storm track must have followed this channel, otherwise the nourishment of the Scandinavian ice-sheet is difficult to understand. This reconstruction is based on many small isolated pieces of evidence which fit together to form a fairly coherent picture.

The first Ice Age, of which we have much detailed knowledge, immediately preceded the Cambrian era (about 520,000,000 years ago), and probably resembled the Quaternary in its general development, but the intervening Permo-Carboniferous Ice Age presented some very peculiar features, which have given climatologists many headaches. The great ice-sheets formed not in high latitudes, but in quite low latitudes (Fig. 2 reprinted from *Climate through the Ages*)*. The main centres were in South America, Central and South Africa, India and Australia, all of which were largely covered by true ice-sheets which reached the sea in many places. Just before and during the early stages of this glaciation much of the Northern Hemisphere was occupied by rich forests, which deposited the coal measures. The only considerable traces of ice in northern latitudes are the remains of a predominate glaciation near Boston, in the north-eastern U.S.A.

Ice near the Equator and sub-tropical forests in Europe form the greatest paradox known in meteorology. Many geologists have escaped from the dilemma by supposing that at that time the South Pole was wandering about near the present Equator, while the Equator ran through Europe and North America, but this solution raises more difficulties than it solves. A somewhat less drastic explanation is set out diagrammatically in Fig. 2. South America, Africa, India and Australia all formed part of a single lofty crescent-shaped continent known as Gondwanaland, the horns of which enclosed a cold southern ocean. North of Gondwanaland a broad arm of the sea carried a very warm current from the tropical seas of the East Indies across Europe to the Arctic. The great temperature difference between the seas north and south of Gondwanaland caused a permanent flow of air across the continent

*Brooks, C. E. P. *Climate through the Ages*, 2nd edition. London (Benn), 1949.

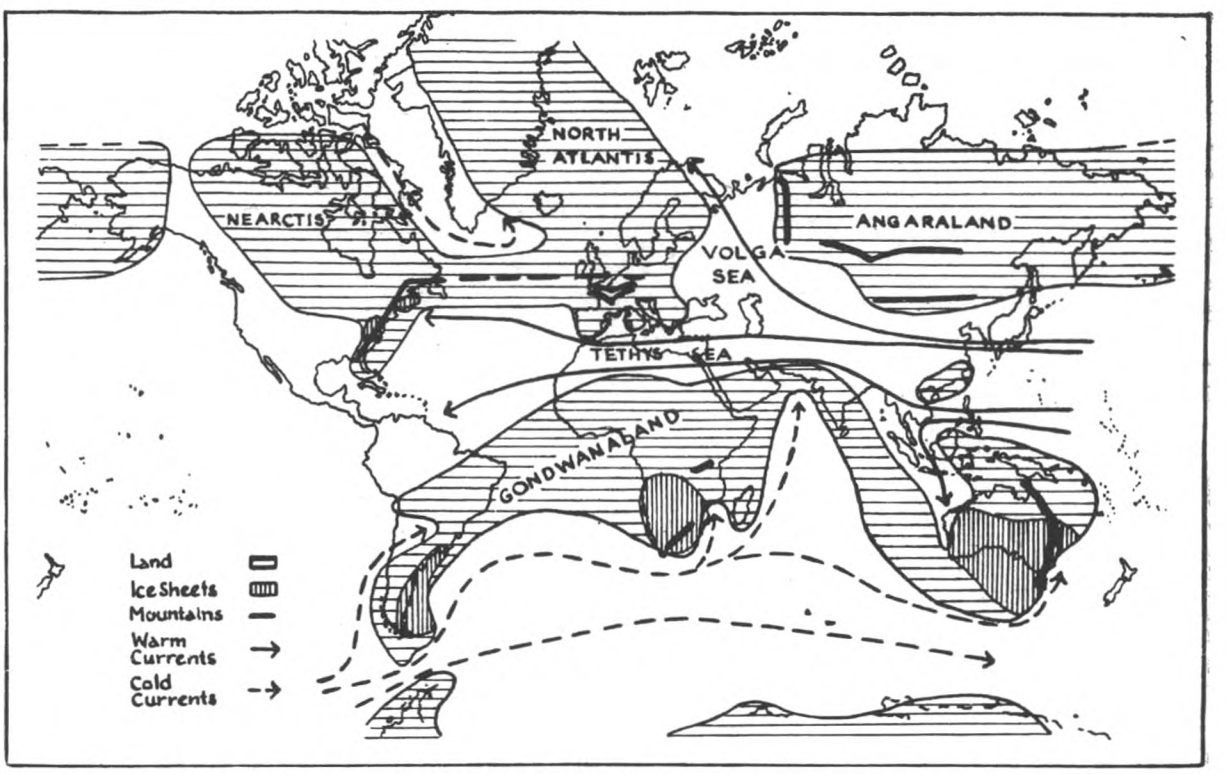


Fig. 2

Distribution of land, ice-sheets and ocean currents during Permo-carboniferous ice age

from south to north, giving rise to heavy snowfall on the high mountains and forming great glaciers which, protected from the tropical sun by a thick mantle of cloud, grew into ice-sheets of continental size. When these reached the sea they spread colder conditions throughout the world, and the rich flora of the coal measures gave place to desert and savannahs occupied by a hardier flora from the Southern Hemisphere. This explanation of the peculiar climate was received with scepticism when I first put it forward, but is now beginning to find some favour with students of past climates.

We may end this brief survey of the meteorological history of the oceans with a reference to the quite considerable changes which have happened since the end of the maximum of glaciation during the Quaternary Ice Age, which was about 10,000 years ago. As the ice-sheets melted off the land, the North Atlantic rapidly cleared. Summers were warm, but at first winter temperatures remained low and the Arctic retained a congested mass of drift-ice. By 5,000 B.C., however, temperature all over the world had risen to such an extent that most places were warmer than they are today. The Gulf Stream penetrated well into the Arctic Ocean, for peat bogs formed on Spitsbergen, and it seems probable that the floating ice was broken up and largely dissipated. This period is known as the " Climate Optimum "; many of the mountain glaciers disappeared entirely, and even the great ice-sheets of the Antarctic and Greenland lost an appreciable part of their volume, for the water set free by the melting of the ice sufficed to raise the sea-level all over the world by several feet. It is most likely that at this time the East Greenland and Labrador Currents carried little or no ice, and the seas were less stormy than now. Towards the close of the Climate Optimum, about 3,000 B.C., climate became widely uncertain.. Decades or centuries of stormy rainy weather alternated with decades or centuries of drought. A

possible interpretation of this is that the Arctic icecap was very unstable, forming and persisting for some time and then breaking up again. A quiet dry period in the Bronze Age saw the beginning of ocean traffic; for example, between Scandinavia and Iceland. But about 500 B.C. these fine interludes ceased and cold stormy weather persisted for the best part of 1,000 years. By the seventh or eighth centuries A.D., however, conditions were quieter again and the Norsemen began to push out far over the ocean. Iceland was colonised, then Greenland, and probably the hardy voyagers even reached America. The sailing routes of the time show that the dangers from ice off the Greenland coast must have been much less than now, and both Greenland and Iceland were certainly considerably warmer. The weather worsened, however, and ships found it harder and harder to get through. By the fifteenth century the colonies in Greenland were lost. Soon afterwards the glaciers of Norway, Iceland and the Alps began to expand again, overrunning the mountain farms.

The latest stage in the drama is being enacted now. The glaciers, after their last great advance about 1850, are almost everywhere in retreat. Farms which have been ice covered since 1400 are being set free, and the warm ocean currents are penetrating further and further north, taking the fish with them. Cod, which was almost unknown to the Esquimaux 100 years ago, is now their staple article of diet. The edge of the floating Arctic icecap is retreating towards the pole, so that Spitsbergen is now accessible for seven months in the year instead of only three as it was 50 years ago, and sea traffic along the coast of western Siberia is becoming feasible. The amount of ice in the East Greenland Current is much less, and Iceland is very rarely beset. But the retreat of the glaciers is not yet sufficiently rapid to make much difference to the level of the sea, which is only rising about an inch in 25 years. Whether the process will go on until the seas are once again free of ice, or whether and when the tide will turn, we do not know.

FUTURE ARTICLES

We are printing here, for our readers' interest, a selection of the articles which it is intended to publish in future numbers of *The Marine Observer*:

Planetary movements and phenomena, by E. W. Barlow.

Forecasting for the D-day landings, by C. K. M. Douglas.

Deep sea prospecting, by M. N. Hill.

Development of radio communications for maritime Meteorological Services, by E. J. Bell.

Errors of aneroid barometers, by H. Jameson.

Comparisons of intake and bucket methods of measuring sea-surface temperatures, by T. H. Kirk and A. H. Gordon.

ICE IN THE NEWFOUNDLAND REGION DURING FEBRUARY, 1950

BY P. R. BROWN, M.Sc., D.I.C.
(Marine Branch, Meteorological Office)

The following are extracts of reports received in the Marine Branch of the Meteorological Office of ice (excluding icebergs) in the Newfoundland region during February, 1950.

Date	Position		Description	Remarks
	Latitude	Longitude		
	° ′	° ′		
		T.E.V. *Beaverglen*		
17	46 40N to 46 25N	47 28W to 48 21W	Light pancake ice.	Intermittent patches.
		S.S. *Cairnvalona*		
18	47 30N	48 00W	Pancake and heavy sludge.	Passed through continuous pancake and sludge ice intercepted by lanes of clear water.
19	46 30N	51 30W	No ice.	Passed clear of ice into open water. Sea temp. 28°F.
		S.S. *Newfoundland*		
13	East coast of Newfoundland.		Fields of slob-ice.	Encountered western extremity of fields of slob-ice between Cape Broyle (47° 03½′N., 52° 50½′W.) and Cape Spear (47° 31′N., 52° 37′W.) to within 2 miles of coast in places. Extent of ice in E'ly direction undeterminable.
14, 15	From St. John's to 47° 34′N., 47° 32′W. (approx.)		Fields of slob-ice.	Encountered extensive fields of slob-ice extending from St. John's Harbour entrance for approx. 175 miles due E.
		S.S. *Nova Scotia*		
17	46 58N to 46 33N	47 12W to 48 34W	Fields of slob-ice.	Scattered patches, becoming heavier towards the coast of moderate to heavy field- and slob-ice; mainly about 2 ft. thick on the Banks, becoming 8 ft. to 10 ft. off shore. Vessel encountered similar ice from last position to Cape Race and thence to St. John's, and upon arrival it was found that heavy pack-ice had jammed all approaches to entrance. It was not until a S'ly gale sprang up, which cleared the entrance, that vessel was able to enter the harbour on 21st February.

These reports are shown plotted in Fig. 1. Also included in Fig. 1 are the average and extreme limits of pack-ice taken from the atlas of *Monthly Ice Charts of the Western North Atlantic* (M.O.M. 465), published by the Marine Branch in 1944.

It can be seen that these reports agree well with the limits given in the atlas. They indicate, however, that the southern limit of pack-ice was farther south than is normal in mid-February. The reports confirm the existence of the northward bulge of the southern limit of the pack-ice about 50°W., which is indicated by the probable mean limit of pack-ice shown in the figure.

This bulge is probably due to the divergence of the Labrador Current in this region into two separate branches, one of which turns eastward and, mingling with the northern waters of the Gulf Stream, eventually forms part of the North Atlantic Current, while the other branch turns westward and passes south of Newfoundland. For convenience these currents are shown in Fig. 2. In the area of divergence currents are weak, and consequently the

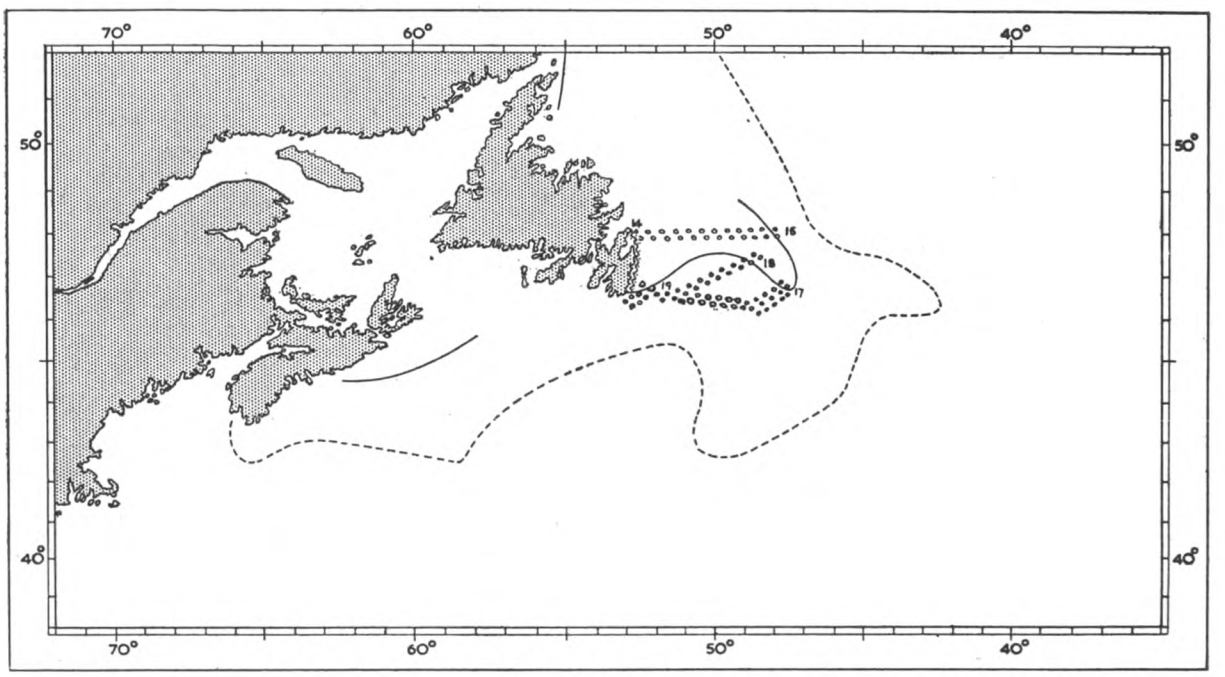


Fig. 1

Firm line gives probable mean limit of pack-ice in February, 1920-1939, dashed line gives extreme limit of pack-ice in February, 1920-1943.

Other symbols show ice reported during February 1950—circles indicates sludge or pancake ice, zig-zag line (along coast of Newfoundland) indicates field-ice. Figures indicate dates.

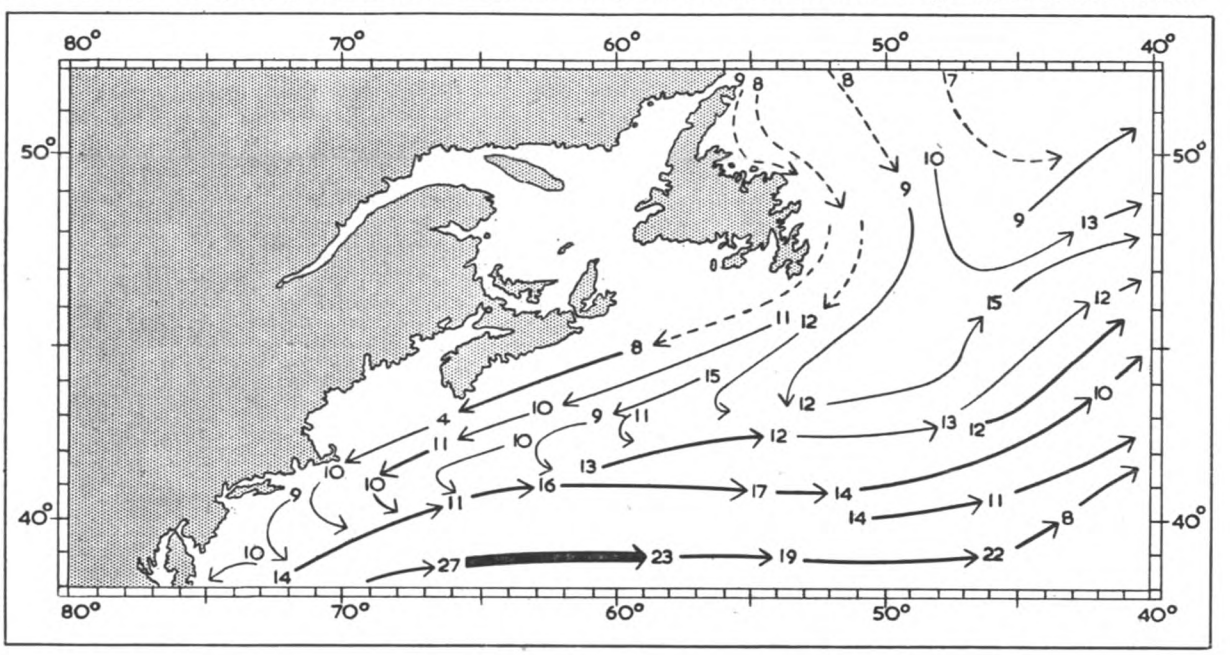


Fig. 2

Predominant currents during February to April

The thickness of the arrows indicate the constancy of the predominant current in the direction shown as follows:—

25-49% ——→ 50-74% ——→ 75-100% ➡

Constancies of under 25% are not shown.

The figures against the butts of the arrows give the rate in miles per day.

In regions where insufficient observations are available the generally accepted knowledge of the direction of flow is shown by a broken arrow thus:

- - - - - - - - - - →

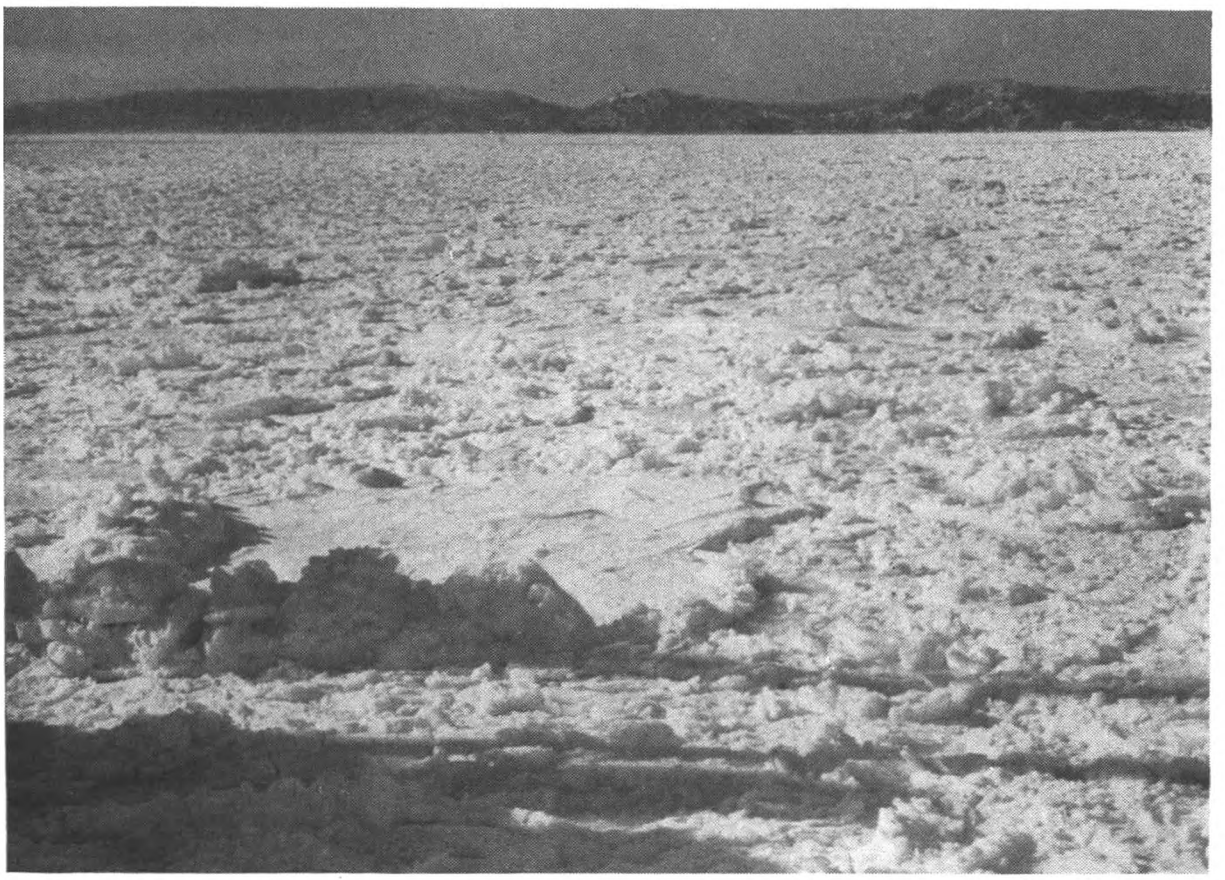


Fig. 3

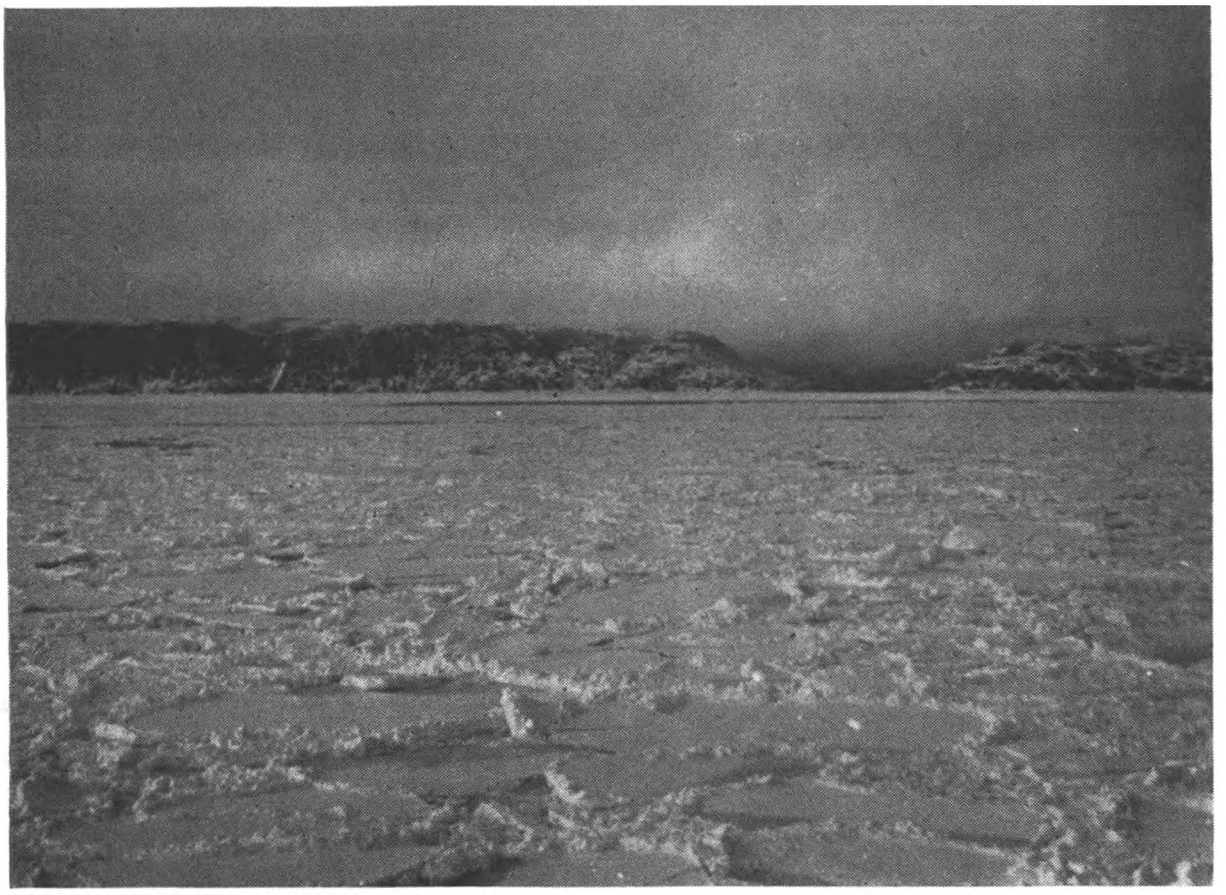


Fig. 4

sea temperature tends to be higher since there is no strong supply of cold water from the Davis Strait. Furthermore, the action of the two divergent branches tends to divert the ice to the eastward or westward, leaving the area of divergence relatively free. The correlation between ice, ocean currents and sea temperatures shows the value of all such reports in investigations concerning ice. Wind, of course, also has a great effect on the movement of ice.

Of unusual interest in the above ice reports are the observations of large areas of pancake-ice. This type of ice consists of newly-formed pieces of ice, approximately circular, about 1 ft. to 6 ft. across, with raised rims. It is formed in low sea-surface temperatures when slush is present and the water is in motion. The ice then congeals into small lumps which increase in size and take on the form of round discs. The raised rims are due to collision between the discs and the adhesion of slush. Pancake-ice can also be formed from ice rind, when this is broken into small pieces which increase in size and are rounded by collision. It can also be formed directly at very low temperatures without passing the stage of slush. Fig. 4 shows some " pancake " effect.

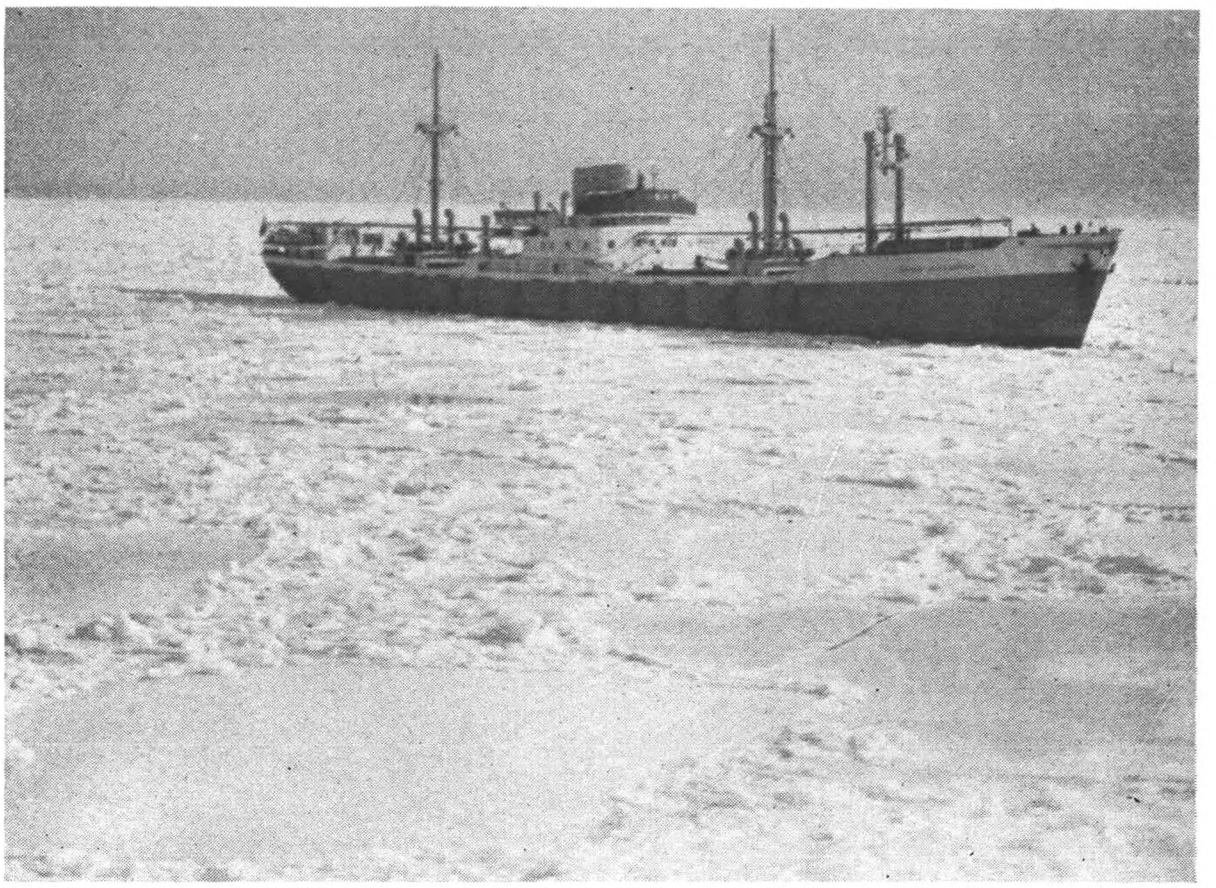


Fig. 5

The three photographs of ice shown on these pages were taken from S.S. *Nova Scotia* between 17th and 21st February. Fig. 5 shows the Dutch ship *Prins Alexander* hard fast; this ship was subsequently broken out by the *Nova Scotia* and arrived at her destination undamaged.

RECENT BRITISH MARINE METEOROLOGICAL AND SURFACE CURRENT ATLASES

BY H. JAMESON, D.SC.

A large number of marine atlases have been prepared and published by the Marine Branch of the Meteorological Office, mainly based on observations supplied voluntarily by British seamen, and it seems desirable to give some account of the more recent of these publications and the information contained in them, which may be of interest and value to oceanographers as well as to meteorologists and seamen. The atlases described in this article are mainly confined to those prepared during the last decade.

Monthly Meteorological Charts of the Atlantic (M.O. 483)
Monthly Meteorological Charts of the Western Pacific (M.O. 484)
Monthly Meteorological Charts of the Eastern Pacific (M.O. 518)
Monthly Meteorological Charts of the Indian Ocean (M.O. 519)

These are four large atlases, which deal comprehensively with the climatology of the oceans, month by month. They were prepared during the war, primarily for operational purposes.

The data included are, save for minor exceptions, the same in all four atlases. For the most part these data are shown, not by plotting the computed monthly mean values, monthly percentage frequencies, etc., but by drawing on the charts of the oceans isopleths, i.e. lines drawn through all places with the same mean value, percentage frequency, or whatever the factor to be represented might be. The only exceptions to this rule were wind and swell data which, being vector quantities representing both magnitude and direction, were usually not suitable for representation by isopleths.

The advantages of using isopleths are: (1) that they give a general picture of the magnitude or intensity of the factor, and of its variations, over the whole area; and (2) that biased or otherwise erroneous values can be detected and allowed for when drawing these lines. The isopleths drawn for any month were always compared with the corresponding isopleths for the preceding and, if possible, for the following month, to avoid the deletion of peculiarities that were genuine phenomena. Unfortunately, as the charts had to be prepared and distributed month by month, it was not always possible to compare isopleths with those for the following month.

For the greater part of the data shown in the atlases, the observations were grouped over 5° " squares " (i.e. the areas bounded by meridians and parallels 5° apart), and were treated as if they had all been observed at the central point of each area. However, temperatures, both for the sea surface and the air, were grouped over 2° squares. North Atlantic pressures, too, were grouped over 2° squares, but this was found unsatisfactory, and for the South Atlantic and the other oceans the grouping was by 5° squares.

For a more detailed account of the methods used in working up the observations, the reader is referred to a series of articles in earlier numbers of this publication.*

For both air and surface sea temperatures the isotherms of monthly mean, maximum and minimum temperatures, and of the range between maximum

*Jameson, H. " Ship's Observations and the Climatologist ", *The Marine Observer*, July, 1948, to April, 1949.

and minimum, were plotted. For technical reasons, however, the maximum and minimum temperatures shown were not the absolute values, but the five percentile values, i.e. in the case of the maximum, a temperature that was only exceeded by 5 per cent of all the observations available, with a corresponding definition for the minimum percentile. These maximum and minimum percentiles give limits of temperature that are unlikely to be passed to any extent that matters for practical purposes, save under very exceptional circumstances.

Isotherms of the mean monthly differences between sea and air temperatures, which are of importance in connection with visibility and the heat exchange between atmosphere and ocean, were also drawn.

Cloud data are represented by four charts for each month. The data summarised are the total amounts of cloud observed, irrespective of level. Isopleths give the percentage frequency of cloudiness 0–2 tenths, 3–6 tenths and 7–10 tenths respectively, i.e. of light, moderate, and heavy cloud cover, while another chart gives the mean cloud amount in tenths of the sky covered. In the Atlantic atlas (M.O. 483) the percentage frequencies shown are those for 0–6 tenths, 7–8 tenths, 9–10 tenths respectively, but percentage frequencies for the groups 0–2 tenths, 3–6 tenths, 7–10 tenths have since been computed and are available if required.

Other weather factors represented by monthly isopleths are the percentage frequencies of fog (logged as Beaufort letter " f "), which may be accepted as the percentage frequencies of visibilities less than half a mile; fog, mist or haze (f, m or z), equivalent to visibilities of less than five miles; lightning, including distant lightning (l); snow (s); and precipitation (r, p, d, h or s).

From the wind observations are constructed wind-roses, one for each 5° square. For representing direction the observations are divided among the eight compass points, N, NE, E . . . except within 30° of the Equator, where, because of the greater steadiness of most winds, the observations are divided among the sixteen points, N, NNE, NE, ENE . . . The observations of Beaufort force are grouped into forces 1–3, 4, 5–6, 7, 8–12, and the percentage frequency of winds of each group and direction is represented by the length of a segment of an arrow pointing away from that direction.

Other monthly charts summarise wind data in a more condensed form, either by arrows or by isopleths. On one chart the direction of an arrow represents the direction of the predominant wind in that 5° square, while the type of arrow represents the constancy of that wind. On the same chart are drawn isopleths showing the percentage frequency of winds of forces 0–4 inclusive, while another chart gives the isopleths of the percentage frequency of wind of gale force (Beaufort 7–12 inclusive).

The monthly vector means of all the winds observed in each 5° square have been computed. These vectors give the course of the main air movements over the oceans. They are shown on two charts for each month. On the one chart the monthly mean isobars are shown, while the mean vector wind is represented by a feathered arrow, the number of feathers showing the strength of the mean vector wind. On the other chart the same arrows are shown without feathers, the strength of the mean vector wind being represented by isopleths.

In the Eastern Pacific and Indian Ocean atlases, swell observations have been used to construct " swell roses ". The directions are grouped according

to eight points, N, NE, E . . . while the strengths are grouped according to the three categories, slight, moderate and heavy. In the Atlantic and Western Pacific charts the swell roses show much less detail, the directions being grouped in four quadrants only, while strengths are grouped irrespective of direction. These roses will be replaced by the more detailed roses in the next edition of these atlases.

The atlases also contain charts showing typical tracks of cyclonic storms for the months in which these phenomena occur.

Another feature is a table giving corrections for the diurnal variation of pressure, and giving also the average value of the barometric changes in each hour, due to this diurnal variation, for 10° zones of latitude between 20°N. and 20°S.

Tables are also supplied to convert " percentage frequency of gales, forces 7–12 " to " number of days on which gale strength, forces 7–12, is observed in a 30 day month ".

Monthly Meteorological Charts and Ocean Current Chart of the Greenland and Barents Seas (M.O.M. 402b)

During the war, charts of the Greenland and Barents Sea were required for operational purposes. Meteorological information from these regions is scanty; to obtain data, therefore, pressures at standard positions and temperatures at coastal stations were read off day by day from synoptic charts, received from the U.S.S.R., for the years 1933–37. Geostrophic winds at standard positions, suitably modified in magnitude and direction to the estimated values at sea-level, were also read off, and wind roses were constructed from these and similar data nearer Iceland, read off from the British synoptic charts for 1929–38. Predominant winds and isopleths of percentage frequencies of wind forces 0-4 and 7-12 respectively were also plotted from those data.

From the computed mean pressures, isobars were drawn, and from the computed mean coastal temperatures, isotherms of mean air temperature were extrapolated over the sea, account being taken of the surface sea currents. Data for sea temperatures were so scanty that the charts for sea surface temperatures showed relative isotherms only, i.e. the probable change in mean sea surface temperature from one locality to another.

A single chart, for the whole year, gave the directions of sea surface currents.

Monthly Sea Surface Temperatures and Surface Current Circulation of the Japan Sea and Adjacent Waters (M.O.M. 447)

Monthly Sea Surface Temperatures of Australian and New Zealand Waters (M.O. 516)

Monthly Sea Surface Temperatures of North Atlantic Ocean (M.O. 527)

These atlases deal with mean sea-surface temperatures in more detail than in the more comprehensive monthly meteorological charts of the various oceans. In drawing the isotherms, mean temperatures have been taken over 1°, instead of over 2° squares when this was deemed desirable and the number

of observations permitted. Known surface current circulations have sometimes been used as a help in drawing the isotherms. Foreign data, particularly Japanese observations for M.O.M. 447 and Danish observations for M.O. 527, have been combined with British data. In M.O.M. 447 are included chartlets showing the surface current circulations near Japan, taken from Japanese sources.

Quarterly Surface Current Charts of the Atlantic Ocean (M.O. 466)
Quarterly Surface Current Charts of the Western North Pacific Ocean, with Monthly Chartlets of the China Seas (M.O. 485)

These atlases deal only with surface currents. Over the oceans, observations of surface currents are much less frequent than meteorological observations; such data have therefore generally been summarised by quarters instead of by months. For the China Seas, however, chartlets of the currents are given month by month, because of the changes that occur during the monsoons and the complexity of the transitional periods.

To compile current roses, all the surface currents observed in definite areas are grouped together. The directions are allocated to the 16 points N, NNE, NE, ENE . . . while the strengths are grouped as under:

6–12	miles per day
13–24	,, ,,
25–48	,, ,,
49–72	,, ,,
73 or more	,, ,,

For any particular direction, the percentage frequencies of each of these groups are represented by segments of an arrow pointing to that direction.

Areas are chosen in this way. The observations are first grouped in basic areas of 2° in latitude and 4° in longitude. A number of these areas are then grouped together so as to include in each current rose observations of the greatest possible uniformity.

For each of the smaller basic areas, predominant currents are computed, and these are used to construct, on separate charts, flow lines of the predominant current. The direction, strength and constancy of the predominant currents are all shown on these charts.

Vector means of the currents are computed for each basic area and these are represented by arrows on another series of charts.

A more detailed account of the methods used in preparing these charts is given in an article in a previous number of this journal.* In that article two other atlases of surface currents are mentioned: *Indian Ocean Currents* (M.O. 392); *South Pacific Ocean Currents* (M.O. 435). These are earlier publications than those already described. No predominant currents are shown in them.

Work is proceeding on the remaining three areas of the four into which the whole Pacific Ocean has been divided, and in due course the Indian Ocean atlas will be revised, with the inclusion of predominant currents.

*Milburn, K. and Barlow, E. W. " Ocean Currents ", *The Marine Observer*, October, 1949.

Meteorological data available in the Branch

A short note on the maritime meteorological data now in the possession of the Marine Branch may be added. The data received from British ships extend from about 1855 to the present day, with the exception of the years of the two world wars, when data were almost completely lacking. Much of the earlier data was summarised in " data books ", but a large part of the more recent and even part of the earlier data have been punched on Hollerith cards, of which, from British data alone, over 3,000,000 cards are held in the Branch.

In addition the Branch has copies of the Hollerith cards, mainly from German ships, in possession of the Meteorological Office for North-west Germany (formerly the Deutsche Seewarte) at Hamburg; the total number of these cards received up to date is between 7,000,000 and 8,000,000. They have not yet been used for the construction of atlases, but it is hoped to make use of them when the atlases, referred to above, are revised. They are, however, available for other investigations and are frequently used for such purposes.

PRESENTATIONS FOR LONG SERVICE AS VOLUNTARY OBSERVERS*

The quality of the voluntary meteorological work carried out at sea in British Selected Ships, on behalf of the Meteorological Services of the world, was recognised recently when suitably inscribed barographs were presented by the Director of the Meteorological Office to four Merchant Navy masters. All four recipients have been voluntary marine observers for many years.

The first presentation to Captain G. Kinnell, O.B.E., of the New Zealand Shipping Company's S.S. *Rangitata*, took place aboard his ship in London on 29th November. Those present at this little ceremony included Mr. H. Whitehouse, Chairman and Managing Director, Captain Broughton, Marine Superintendent, and Captain Robertson of the New Zealand Shipping Company; Captain Saul, Deputy Master, Captain Elvish, Senior Warden, and Mr. Smith, the Clerk of the Honourable Company of Master Mariners; and Commanders Frankcom and Williams of the Meteorological Office.

Sir Nelson, in making the presentation, mentioned that the masters and officers of the New Zealand Shipping Company's vessels had done voluntary work at sea for the Meteorological Office for 75 years. The first logbook to be received from a ship of this Company was from the *Waitara*† in 1876. She was a full-rigged iron ship of 833 tons and her master, Captain Caborne kept the log himself At the present time no fewer than 19 ships of the New Zealand Shipping Company are members of the Voluntary Observing Fleet, out of a total of 21. Sir Nelson pointed out that this was the second occasion during 12 months that such a presentation had been made to the master of one of this Company's vessels, for Captain Holland of the *Rangitiki* had received such an award in January, 1950, aboard the *Wellington*.

After stressing his appreciation of the good work which the vessels of this Company have thus done, and mentioning the part which Captain Kinnell himself had played during his 35 years' service as a voluntary observer at sea, Sir Nelson made the presentation.

*An earlier notice of these awards appeared in *The Marine Observer*, October, 1950.
†*The Marine Observer*, October, 1950.

Mr. Whitehouse welcomed the guests aboard the ship and said how pleased he was to feel that the vessels of his Company were enabled to contribute so effectively toward our meteorological knowledge in this way, and congratulated Captain Kinnell upon having received the award.

Captain Kinnell, although he had done much meteorological work in the past, stressed that it was not he himself who did this work now but the ship's officers. At the same time he agreed that the personal example of the master did help a lot to promote keenness in this work among the junior officers.

After the presentation those present were entertained to an excellent informal luncheon, at which Mr. Whitehouse presided.

Captain R. Penston

Captain J. A. Myles

A second ceremony took place at the weekly Wednesday luncheon of the Honourable Company of Master Mariners in the Captains' Room at Lloyds, on 13th December, 1950. Those to be presented with barographs were Captain R. C. Vigurs of the S.S. *Eros*, Captain R. A. Penston, of Messrs. T. & J. Brocklebank's *Macharda*, and Captain J. A. Myles of the Cunard liner *Samaria*. Unfortunately the weather took a hand in this ceremony, and a telegram from Captain Vigurs announced that he would be unable to attend as he was fogbound aboard his ship in Northfleet Hope. It is perhaps pertinent to record that fog in the Thames was forecast on this occasion.

About 20 members of the Honourable Company, including the Deputy Master, who took the chair, and the Clerk, were present and, in addition to Sir Nelson, the visitors included Sir Stanley Aubrey, Deputy Chairman of Lloyds.

Captain Saul, on behalf of the Honourable Company, welcomed the guests and said how glad he was that the Company had the opportunity of providing the occasion for this ceremony at their luncheon, and he thanked the Chairman of Lloyds for having so kindly provided such an admirable setting.

Sir Nelson, in making the presentation, said how appropriate it was that it should be made in this Captains' Room of Lloyds, which had such an ancient history, and at the same time in the presence of so many master mariners and members of this Honourable Company.

He mentioned how cordial the relations were between the Meteorological Office and the shipping industry generally, and paid tribute to the ready way in which ship-owners and ship-masters respond in providing observations from the sea. He mentioned that, thanks to our fleet of 500 Selected Ships, the Meteorological Office receives a daily average of about 75 radio weather messages from British ships in the eastern Atlantic, and that these ships similarly send messages during their voyages to other Meteorological Services from all oceans.

He congratulated and thanked Captain Myles for his 29 years' service and Captain Penston for his 24 years' service as voluntary observers, and for the

Captain R. C. Vigurs

Captain G. Kinnell, O.B.E.

excellent work that they had done during that period, and it was thus with much pleasure that he made these presentations to them. A telegram was sent from the assembled company to Captain Vigurs, regretting his inability to be present.

The presentation to Captain Vigurs eventually took place aboard the *Wellington*, headquarters ship of the Honourable Company of Master Mariners, on 21st December. Sir Nelson Johnson made the presentation in the presence of Captain Saul, the Deputy Master, Mr. Smith, the Clerk, and Commander Frankcom. Sir Nelson warmly congratulated Captain Vigurs and thanked him for his 27 years' voluntary service, and particularly stressed the great personal interest that he had shown in this work, as was evidenced by an article he had contributed to *The Marine Observer* on " The Use of Charts in Weather Navigation ".‡

Captain Vigurs, in thanking Sir Nelson, said that meteorology was a great hobby to him, and he knew that by the personal interest which he took in the subject his officers were also very keen about this work.

After the presentation Captain Saul hospitably entertained the party to luncheon at the City Livery Club.

‡*The Marine Observer*, October, 1949.

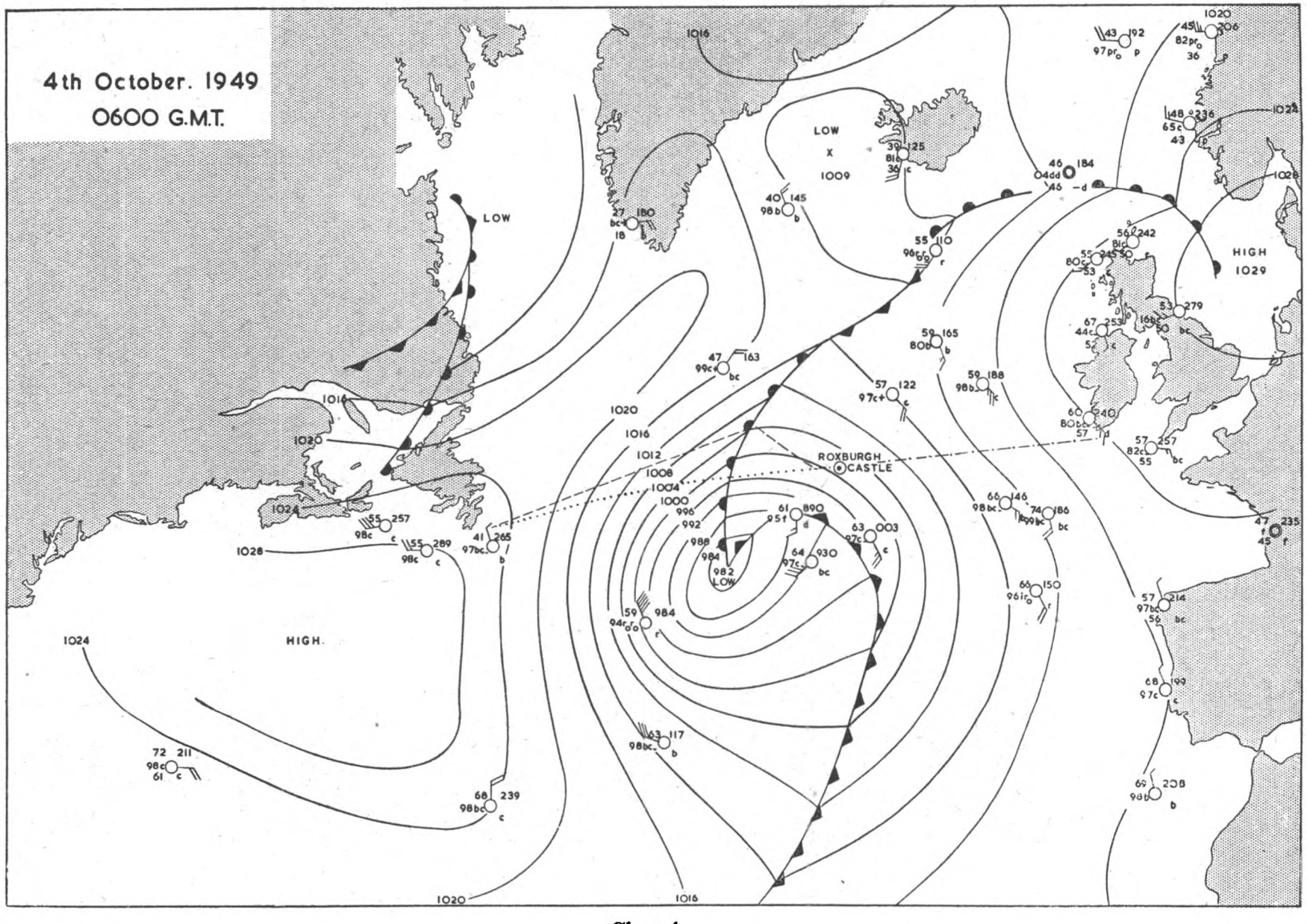

4th October. 1949
0600 G.M.T.
LOW
X
1009
HIGH
1029
HIGH
ROXBURGH
CASTLE
LOW
1024
1028
1020
1016
1012
1008
1004
1000
996
992
988
984
982
LOW

Chart 1.

USE MADE OF ATLANTIC WEATHER BULLETIN

We are printing on these pages charts showing the use which a Voluntary Observing Ship, M.V. *Roxburgh Castle* (Captain J. D. B. Fisher), made of the Atlantic Weather Bulletin as broadcast by Portishead Radio.

In the first example (Chart 1) the ship was *en route* from Liverpool to Cornerbrook (Newfoundland). The normal Great Circle track from Fastnet to Cape Race was followed out as far as 30°W. The ship then steamed in a north-westerly direction to about 150 miles north of the normal route, then followed a Great Circle route to Cape Race. The reason Captain Fisher made this decision can be seen from the weather chart for 3rd October, 1949, when the *Roxburgh Castle* was in 51½°N., 28½°W.

A small but deep depression was travelling in a north-easterly direction so that, if the ship had continued on its normal course, the centre of the depression would have passed ahead of the ship, giving winds possibly reaching force 10 from the north-west. In Captain Fisher's own words:

> Our deductions from these charts proved quite correct and, by taking the diversion to the northward, we avoided the low pressure area which was moving ENE. We thus secured the advantage of the easterly and north-easterly winds in the northern half of the system instead of running into the force 10 north-westerly winds which prevailed on the western side of the southerly half of the system.
>
> It was through the information derived from these charts that I was able to make a crossing from Fastnet to Cape Race at an average speed of 15.9 knots, which I think you will agree is a good passage in wintertime.*

It will be seen that it was only through prompt action that such great advantage was made of the forecast.

In the second example (Charts 2 and 3) the depression covered a large area of the North Atlantic, so it was decided to steam south so as to take advantage of the calmer weather which prevailed in the neighbourhood of the Azores Again quoting Captain Fisher:

> Our forecasts from these charts have worked out extremely well and we were again enabled to dodge round the worst of the incessant depressions and avoid the full weight of head winds and seas—a most desirable accomplishment, I assure you, when one's mean draft is just over 16 ft.*

The actual distance travelled by making the detour was 3,650 miles as compared with 3,100 miles had the ship followed the normal route—an extra 550 miles! It is doubtful if the ship gained much time on this voyage by making the diversion, but it certainly escaped the risk of considerable damage by head winds and heavy seas.

On all these charts the track normally taken by ships is shown as a dotted line. The track taken by the *Roxburgh Castle* is shown by a dashed line.

*These quotations are extracts from letters from Captain Fisher to the Marine Superintendent of the Union Castle Mail S.S. Co. Ltd.

J. E. B.

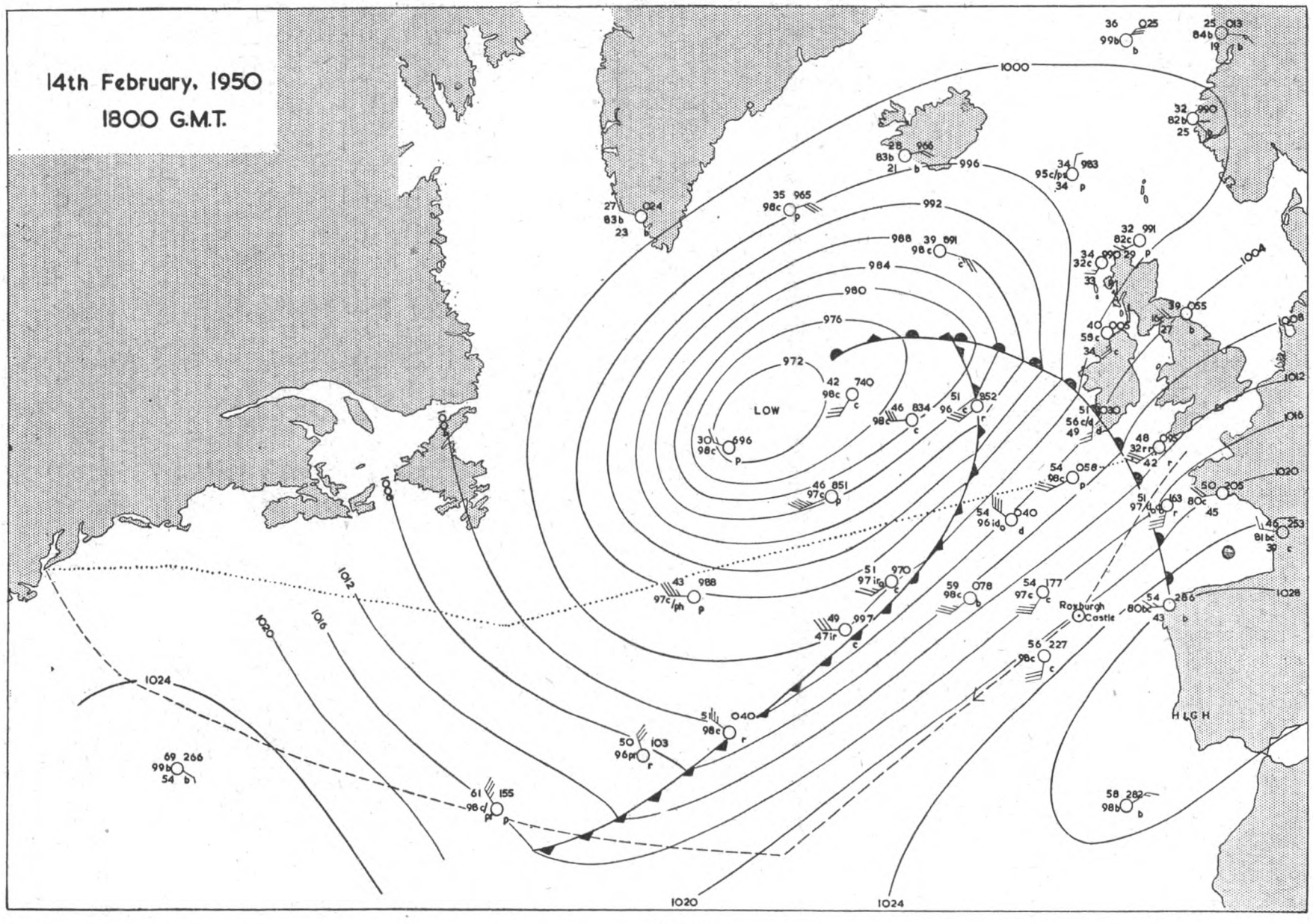

14th February, 1950
1800 G.M.T.
LOW
HIGH
Roxburgh Castle
1000
992
988
984
980
976
972
1004
1008
1012
1016
1020
1024
1028

Chart 2.

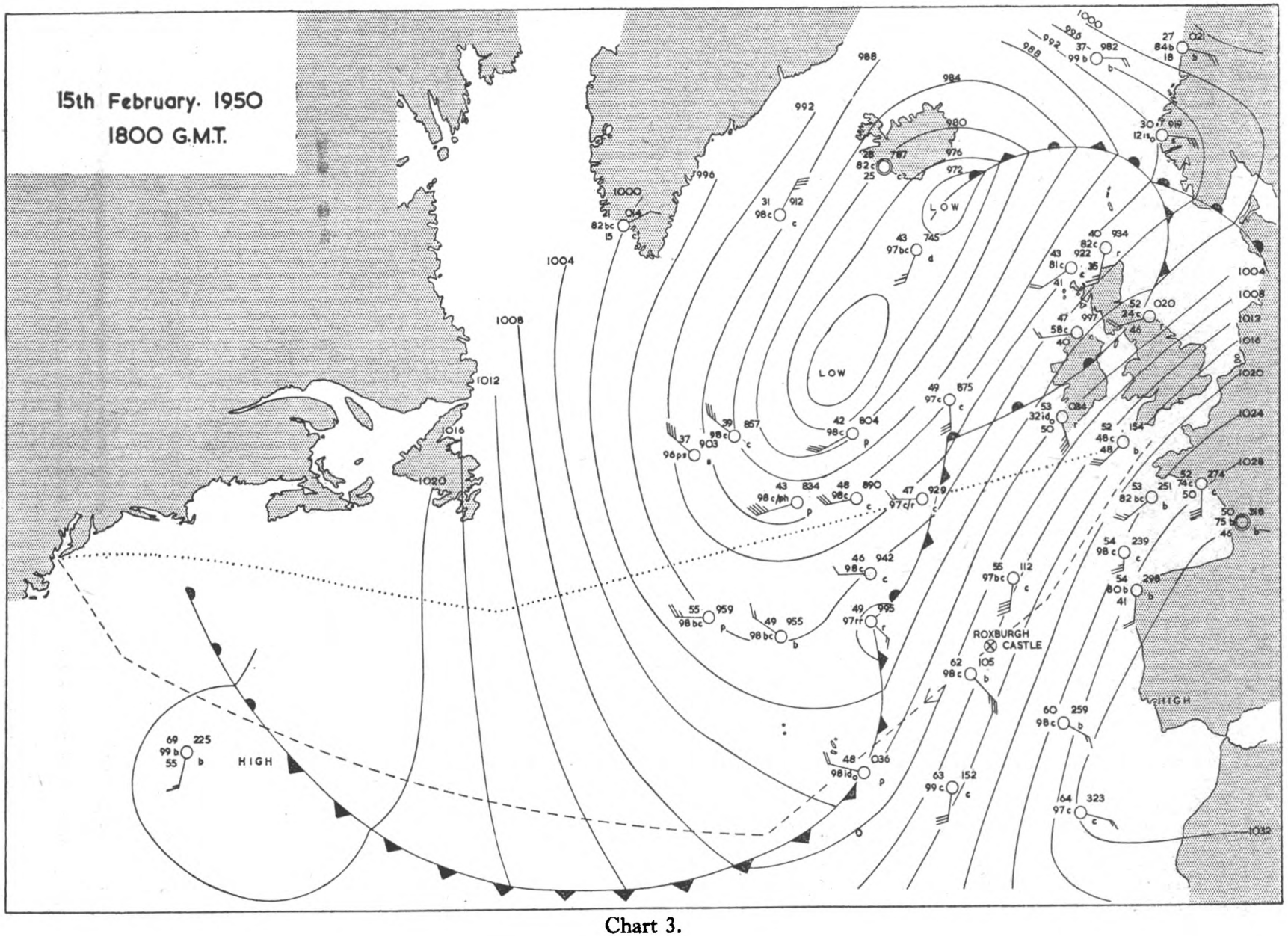

15th February. 1950
1800 G.M.T.
LOW
LOW
HIGH
HIGH
ROXBURGH CASTLE
1000
1004
1008
1012
1016
1020
1024
1028
1032
988
992
996
980
984
972
976

Chart 3.

OBSERVING THE APPARENT WIND ON SHIPBOARD

BY F. GRAHAM MILLAR AND H. W. MACPHAIL
(Meteorological Division, Department of Transport, Canada)

At times conditions may not be favourable to estimating the force of the true wind according to the appearance of the sea surface, yet observations will still be required. In this article numerous signs are described by which the apparent wind can be estimated on shipboard, from effects observable in the rigging of the ship, on the person of the observer and otherwise. The apparent wind requires a correction in direction and speed for the course and speed of the ship.*

The accepted criteria for estimating the strength of the wind in terms of the condition of the sea surface often cannot be observed at night, especially when winds are light. Further, when in the lee of a shore it is almost impossible to make a suitable allowance for the lee effect.

For the wind to develop the sea conditions which are representative of the open sea, the fetch to windward must be at least somewhere near 150 miles. Moreover, when the wind changes direction or springs up, some hours are required to develop the sea fully. The need for observations of the wind force remains, even when the sea surface cannot be seen, or when its condition cannot well be used for the estimation.

Weather observations at sea are scarce during the hours of darkness, and such observations as are obtainable are therefore all the more valuable. Ship observations begin to be of real value when about 50 miles from coastal observing stations, but at such a distance the fetch is insufficient to develop the characteristic state of sea when the wind is offshore. Observations may be required in confined waters; for example, they are necessary on the Great Lakes of North America for the establishment of a factor between the wind on the open lake and anemometer observations ashore, and to check the relation to the barometric gradient. Super-gradient winds are common on inland waters and at places on the oceans. Very few ships on the high seas are equipped with anemometers. For these reasons it is desirable to establish means of estimating the wind without reference to the state of the sea. The criteria are necessarily associated with the apparent wind, as contrasted with the true wind.

The true wind speed is that which may be estimated from the state of the sea surface, or measured with an anemometer on a stationary mounting such as a lighthouse. The direction of the true wind is referred to true north (not the magnetic), and may be estimated from the direction of sea waves or measured with a vane in a fixed location.

The apparent wind speed is the speed of the wind relative to the ship. When the vessel is at sea this is generally greater than the true wind speed whenever the true wind is forward of the beam, and weaker or reversed when the true wind is abaft the beam. The apparent wind speed is best measured with a shipboard anemometer, provided the exposure is efficient. The primary purpose of this article is to tabulate a description of some effects observable on shipboard by which the speed of the apparent wind can be estimated. A correction for the motion of the ship is necessary both to the speed and direction to derive the true wind from the apparent.

*Table V(a) " Ships' Code Card ", Table XVIII " *The Marine Observer's Handbook* " (7th edition). Table to obtain approximately the true force and direction of the wind from its apparent force and direction on the deck of a moving vessel.

The signs which may be used to distinguish the various forces of the apparent wind are of the following types: feel of the wind on the face and figure; upper limit of the temperature at which the wind will sting the cheeks; how the wind takes hold of clothing; angle at which smoke rises; behaviour of halliards; sound of the wind in the rigging and superstructure; behaviour of a pennant; behaviour of a heavy flag, such as the ship's ensign; other effects. These signs have been observed by H. W. MacPhail in the Canadian ocean weather ship H.M.C.S. *St. Stephen*, with the results tabulated.

TABLE. Beaufort Equivalents of the Apparent Wind on Shipboard

BEAUFORT 0. Smoke rises straight up.

BEAUFORT 1, 2 knots, light air. Barely perceptible smoke drift.

BEAUFORT 2, 5 knots, light breeze. Wind barely felt on face. (A tendency to overestimate wind needs to be avoided when temperature is below 32°F.) Smoke rises at 80°.

BEAUFORT 3, 9 knots, gentle breeze. Wind felt on face (same note as above). Smoke rises at 70°. Taut halliards shake slightly. Pennant extends and flaps.

BEAUFORT 4, 13 knots, moderate breeze. Slight pressure of wind felt on face. Smoke rises at 50°. Slack halliards curve and sway but do not assume fixed bent position. Taut halliards do not bend but whip slightly. No noticeable sound in rigging. Flapping of pennant more marked at fly end. Heavy flag flaps limply but does not extend.

BEAUFORT 5, 18 knots, fresh breeze. Wind felt on face as if close to ordinary electric fan; stings face in temperature below 33°F. Smoke rises at 30°. Slack halliards whip while bending continuously to leeward. Taut halliards maintain slightly bent position. Low whistle in rigging. Heavy flag does not extend but flaps along entire length.

BEAUFORT 6, 24 knots, strong breeze. Wind stings face in temperatures below 35°F Slight effort to maintain balance against wind. Smoke rises at 15°. Both slack and taut halliards whip slightly in bent position. A low moaning, rather than a whistle, is heard in the rigging. Heavy flag begins to extend and flaps more vigorously.

BEAUFORT 7, 30 knots, high wind or moderate gale. Wind stings face in temperatures below 38°F. Necessary to lean slightly into wind to maintain balance. Loose oilskins begin to inflate and pull against strength of one's arms. Smoke rises at 5° to 10°. There is still a slight whip in the halliards. Whistling and medium moaning heard in rigging. Heavy flag extends full length and flaps at fly only. Loose canvas protectors around bridge whip slightly against supports.

BEAUFORT 8, 37 knots, gale or fresh gale. The head is pushed back by the force of the wind if allowed to relax. Oilskins inflate and pull strongly. Halliards rigidly bent. Loud whistling in rigging. Heavy flag flies straight out and whips from the hoist. Loose canvas " dodgers " or protectors held tight against supports.

The apparent wind was measured in these observations. H.M.C.S. *St. Stephen* a frigate, is fitted with two anemometers at the ends of the main yard, 50 ft. above the waterline, and the one more to windward was utilised.

Obviously it is only on objects fully exposed to the wind that the effects are to be observed properly. The observer must take up a freely exposed, windward position to feel the effects upon face and figure. In these observations the observer stood on the windward side of the bridge. Effects on halliards extending from the yard to the bridge were observed on the windward side. The pennant and ensign were at the top of a 30 ft. mast on the quarterdeck. It is known that the wind speed increases somewhat with increasing height from the sea surface, but the exposure of the anemometers and of the chosen objects were all such as to secure an observation of the wind speed at a typical level.

The angle of rise of the smoke from the funnel, as seen from the ship, was a factor which could be observed satisfactorily, although only approximately.

Considerable reservations would be called for in interpreting the appearance of the "smoke plume" rising from another ship. No change in the angle was observed as an effect of the temperature of the atmosphere. As the flue gases would mix considerably with the air within a few feet of the funnel, thus reducing their temperature, the angle should also be independent of the temperature of the smoke, except within 5 ft. or 10 ft. of the funnel.

A couple of cautionary notes are called for. If, with a light or following wind, the ship is rolling considerably, some allowance will have to be made in the criteria associated with cordage and flags. The observer must be careful not to over-estimate the wind force at night; apparently the sounds in the rigging tend to be more impressive to a man alone on the bridge in the darkness.

Facts that would determine forces above force 8 could not be distinguished, except that the noise in the rigging increased in volume until at force 10 normal conversation could not be heard at a few feet distance It was observed that gusts increased from 5 to 10 knots at force 8 to as high as 30 knots at force 10. At the higher forces the true wind can ordinarily be estimated from the sea condition. The reduction of visibility by spray should be independent of the fetch or duration of the blow, but where these have been limited, the waves will not reach the characteristic height.

The method of correcting the apparent wind for the course and speed of the ship has been discussed in various handbooks, but is briefly reviewed here. It will be assumed that the direction of the apparent wind is being observed as an angle from the ship's head. It will also be assumed that currents and leeway are negligible.

The graphical method of correcting the apparent wind is illustrated in Figs. 1 and 2, the first of which is concerned with an apparent wind on the starboard bow. Let the top of a piece of paper lie towards the ship's head. From a point A a line is drawn towards the foot of the paper to point B, with AB equal to the speed of the vessel on a scale of $\frac{1}{8}$ in. to the knot, or any other convenient scale. From A a line AC is then drawn in the direction to which the smoke streams, with a scale length equal to the apparent wind speed. CB is joined and produced beyond B to W. The scale length of CB is the speed of the true wind in knots, and ABW is the angle of the true wind direction from ship's head. It is not essential to use a protractor to measure the angle as it can be estimated to the nearest 10°. It should be seen quite readily that the same wording describes the geometrical construction illustrated in Fig. 2, in which the apparent wind is on the starboard quarter. And further, the wording describes the construction when the wind is on the port side, though the figures would have to be reversed by placing point C on the opposite side. The triangle ABC is called the triangle of the composition of velocities.

The correction of the apparent wind can be carried out by reference to a table. Such a table is to be found in *The Marine Observer's Handbook*, M.O. 522b (7th edition, 1950), Table XVIII, and on *Ship's Code Card*, Form 138A, Table V(*a*). In this table it is first necessary to select a column according to the apparent Beaufort force and the speed of the vessel, which are shown across the top. Then in the appropriate line is to be found the true wind direction in degrees off the bow and the true force. Reference of the true wind to true north has already been discussed.

Finally, the true wind direction is to be referred to true north. When the wind is on the starboard side, the true wind direction in degrees off the bow is to be added to the heading of the ship (0° to 360° system): 360 is to be subtracted if the sum is more than 360. When the wind is on the port side, the true wind direction in degrees off the bow is to be subtracted from the heading of the ship. Should the heading be the smaller of the two figures, 360 is to be added to the heading before the subtraction.

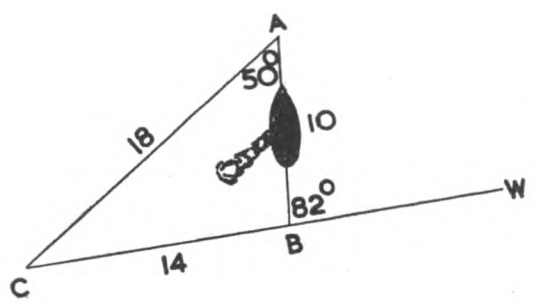


Fig. 1

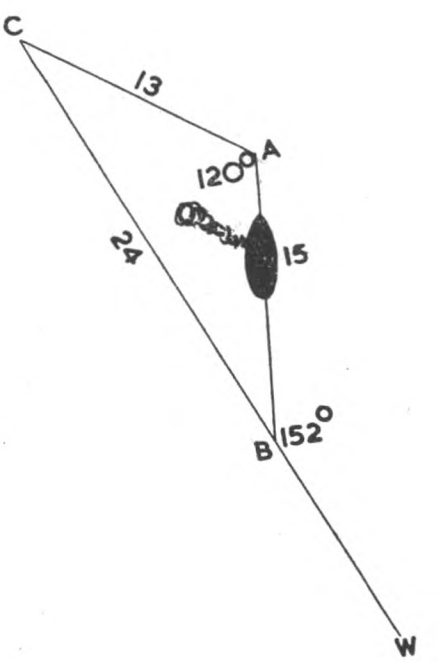


Fig. 2

Examples

(1) Vessel's course 178°, speed 10 knots, apparent wind 50° from the starboard bow, apparent force 5 Beaufort, or 18 knots. This is the case illustrated in Fig. 1. By measurement of the figure, the true wind is 14 knots or Beaufort 4, and the direction 82° off the bow. The same result may be read from the table. Referred to true north, the true wind direction is 178 plus 82, equals 260°.

(2) Vessel's course 95°, speed 15 knots, apparent wind 120° off the starboard bow, apparent force 4 Beaufort, or 13 knots. This is the case illustrated in Fig. 2. By measurement of the figure, the true wind is 24 knots, force 6, and the direction is 152°. Almost the same result may be read from the table. Referred to true north, the direction is 95 plus 152, equals 247, or nominally 250°.

The examples have been chosen so that the precise values of the ship's speed and the apparent wind direction off the bow are to be found in the margins of the table. Where the actual values are not precisely those tabulated, the nearest tabulated values should generally be chosen. When the force of the apparent wind is only estimated, interpolation is scarcely warranted. However, when the apparent wind velocity has been measured by a properly exposed anemometer, interpolation is warranted. The graphical method is recommended for solving the problem accurately. The U.S. Weather Bureau supplies a small plotting board for the purpose to anemometer-equipped ships, of which it has 38 on the Great Lakes.

It has been found that some ships' officers without experience in weather observing are unable to estimate the wind closely or lack confidence in their ability to do so. When an anemometer has been installed, officers have soon learned to estimate the speed within a few knots. Undoubtedly they have learned a number of signs which they have perhaps not put into words even for themselves. The tabulation presented in this paper should permit estimation of the apparent wind force with an error not exceeding one step in the Beaufort scale. When the observer has made the correction to the true wind he should be encouraged to find substantial agreement with the true force estimated from the appearance of the sea. It should then be possible for him to estimate the wind force confidently and correctly under adverse conditions.

A NEW USE FOR THE BAROGRAPH

After a steering lesson at the wheel a bridge boy examined what he thought was the course recorder !

Editor's Note.—This drawing is based on an actual occurrence which took place recently aboard a British selected ship, and was mentioned in a letter from the Master.

CAPTAIN R. E. BEARE

Captain Ronald Edward Beare, Principal of Hull Nautical College and High School for Nautical Training, died on 10th September, after an operation. He was 54.

Captain Beare, a native of Southampton, was apprenticed with the Elder Dempster Line, and served throughout World War I in the Merchant Navy. He obtained his extra masters' certificate and eventually became Principal of the Gilchrist Nautical College, Southampton. In 1929 he was appointed to the examining staff of the Chief Examiner of Masters and Mates, Captain W. Ellery. In August, 1933, Captain Beare succeeded Captain W. Hamilton as Headmaster and Principal of the Hull Nautical College.

During World War II he supervised the training of large numbers of naval officers; he also held a commission in the R.A.F. as Instructor to the Brough Flying School and the A.T.C. Some of his students later became Battle of Britain pilots. Merchant Navy officers attended degaussing courses undertaken by Captain Beare and his staff.

During the war the Cadet Department was evacuated to the West Riding, but on return to Hull in 1944 Captain Beare undertook its reorganisation and extension. In addition to the Merchant Navy, Fishing and Cadet Departments, Cookery and Engineering Departments were added to the College for the fishing industry, whilst courses were run for the Inland Water Transport of the Army. Radar, gyro-compass and correspondence courses were in preparation.

From 1946 to 1948 Captain Beare was Secretary of the Association of Navigation Schools. He was Staff Captain of the Hull Blue Water Club, served as nautical adviser on the Secondary Schools Examination Council and Nautical Training Committees of the Ministry of Education and was a member of the Yorkshire Council for Further Education.

Captain Beare had an exceptional gift for teaching and endeared himself to all by his kindly and sympathetic manner. He was highly skilled in handicraft, excelling in the making of old nautical instruments.

His death came as a great shock to the staff and students of all departments of the College. He was widely respected and will undoubtedly be mourned by many thousands of seafarers, from Marine Superintendents to cadets, and by members of the R.A.F. whom he trained.

CAPTAIN C. G. BONNER, V.C.

The death of Captain Charles George Bonner, V.C., D.S.C., R.N.R., which took place in his 66th year at Edinburgh on 8th February, 1951, is noted with deep regret.

Captain Bonner was an officer in the Furness Withy Line when he left to join the Royal Navy at the outbreak of the 1914-18 war. He at first joined the Royal Naval Division and was later transferred to the Royal Naval Reserve with the rank of Sub-Lieutenant for service afloat. When in

CAPTAIN L. A. BROOKE SMITH, R.D., R.N.R.
Marine Superintendent of the Meteorological Office, 1919-1938

command of H.M. Drifters employed on anti-submarine patrol he volunteered for service in Mystery or " Q " ships under Commander (now Vice Admiral) Gordon Campbell, V.C. He was awarded the D.S.C. in 1917 and later that year when in the " Q " ship *Dunraven* won the Victoria Cross in an action with an enemy submarine. At the end of the war Captain Bonner was demobilised and obtained command of the salvage steamer *Bullger*. He later became Chief Salvage Officer of the Forth which position he held at the time of his death.

From May 1924 to October 1936 Captain Bonner was Merchant Navy Agent to the Meteorological Office for the Forth area. It is desired to extend our sympathies to Captain Bonner's family in their sad loss.

CAPTAIN L. A. BROOKE SMITH, R.D., R.N.R.

At his home, Brook Cottage, Hasketon, Woodbridge, Suffolk, Captain L. A. Brooke Smith, R.D., R.N.R., Marine Superintendent of the Meteorological Office, 1919–38, passed away on 21st December, 1950, aged 72.

Louis Alfred Brooke Smith, the son of a master mariner, was born on 3rd December, 1878, at Wynberg, Cape Colony. He received his early education in the Colony and at the age of 15 came to England to join the school ship *Conway*. On leaving her in 1895 he first underwent a navigational course at Broughton's Nautical Academy, London, before commencing his apprenticeship in the full-rigged ship *Siren*, of Greenock. In 1896 he was appointed a midshipman, R.N.R.

On completion of his apprenticeship Brooke Smith obtained his second mate's certificate and turned to steam in the service of Messrs. Bullard, King & Co. Ltd., trading to South African ports. In 1901 he left this firm to do 12 months' Royal Naval Reserve training, as a sub-lieutenant in H.M.S. *Barracouta* on the Cape Station. This was followed by a further 12 months' service as a lieutenant in H.M.S. *Terpsichore*, also on the Cape Station.

On completion of his naval service in 1903 he passed for extra master (square rigged), after which he joined the Orient Line as fourth officer. Gaining rapid promotion through the different grades, he was appointed to command in August, 1913, his first ship being R.M.S. *Omrah*.

In February, 1914, he took over command of R.M.S. *Orontes*, but shortly after war broke out in August 1914 he was called up for active service in the Royal Navy, and was appointed to the Fleet minesweeper *Folkestone*, attached to the Grand Fleet working in the North Sea. From March, 1915, to February, 1917, he was stationed at Larne, in charge of H.M. drifters and M.L's (some 80 to 170 vessels), employed on anti-submarine work in the Northern Approaches. From March, 1917, to January, 1918, he commanded H.M.S. *Carron*, working in the White Sea and off the coasts of Lapland. In 1918 he transferred to the command of H.M.S. *Heroic* on the Mediterranean Station, and remained in this ship until the end of the war. He was then a Commander, R.N.R.

On demobilisation from the Royal Navy in 1919, Commander Brooke Smith was appointed Marine Superintendent of the Meteorological Office, which post had become vacant by the death of Captain Campbell Hepworth, C.B., R.D., R.N.R. Commander Brooke Smith had always been a keen observer for the Meteorological Office, as shown by the meteorological logs received from ships in which he served, and he thus took up his new appointment with a first-hand knowledge of what was required of an observer at sea, and a strong desire to make the work at sea not only of scientific value to the professional meteorologist ashore but of sound practical value to the navigator himself in the daily performance of his duties. He worked unceasingly throughout his tenure of office with this object in view.

All meteorological work at sea had ceased during the four years' war, so that Commander Brooke Smith on taking up his new appointment had to start afresh in obtaining the interest of the shipping community in marine meteorology. Starting at the beginning, he realised that if a high standard of observation was to be maintained in future years, early training would be essential. A cadets' meteorological log was therefore drawn up, to be kept at the three cadet establishments, *Conway*, *Worcester* and *Pangbourne*. By making frequent visits to the larger ports, and giving lectures on the value of marine meteorology to both ship-owners and ships' officers, he was most successful in building up a new Observing Fleet and Voluntary Corps of Marine Observers. By his visits to the ports he was also able to obtain a consensus of nautical opinion as to what steps should be taken to provide the mariner with meteorological information that would be of practical assistance in day-to-day navigation. Hitherto the work at sea had consisted of keeping a meteorological log for climatological purposes only, but with the then rapidly growing use of radio at sea it became possible to apply ships' observations to synoptic meteorology. He drew up a scheme whereby ships when within range of coast stations regularly transmitted their reports to " Weather London " for use in the Forecast Division of the Meteorological Office. A weather bulletin was also broadcast to all shipping on both long and medium waves from a powerful British coast station. This bulletin included reports of weather observed at selected shore stations and by ships in the eastern Atlantic. With such " actuals " at their disposal, ships were encouraged to plot their own simple synoptic charts and to deduce therefrom the probable change of weather that they were likely to experience as they proceeded on their course during the next 12 hours. Ships were also encouraged to broadcast radio weather messages at regular intervals for the benefit of " all ships " in all oceans of the world, so that all in turn could draw a synoptic chart from the data received and so keep themselves weather-wise. This scheme worked so successfully that an extension of it, known as the " Selected Ship Scheme ", was adopted by the International Meteorological Organisation and was brought into use by all maritime nations in 1930. To assist the Voluntary Corps of Marine Observers in obtaining the fullest advantage from the Selected Ship Scheme, Captain Brooke Smith published a book for their use, named *Wireless and Weather: an Aid to Navigation.*

It had been the practice for many years to publish articles of interest on the backs of the old monthly meteorological charts of the oceans, then supplied to all observing ships. With the advances made in meteorology and the

keen interest evinced by marine observers in the subject, this means of keeping them informed was no longer considered adequate. A magazine, *The Marine Observer*, devoted to marine meteorology and written chiefly for the benefit of marine observers, was brought into being in 1924, a particular feature in each number being a section termed " The Marine Observer's Log ", in which were published observations of natural phenomena of every description recorded at sea by individual observers, thus providing a means whereby mariners might pass on their experiences to others.

Another branch of the work which Captain Brooke Smith considered of primary importance was the more exact representation of the set and drift of the surface currents of the oceans. So many fine ships had been lost owing to insufficient knowledge of the vagaries of currents. By interesting marine observers in this matter and encouraging them to forward observations of current, he was able to lay the foundation of the modern method of combining current data statistically and publication of the results in the form of atlases.

The observations recorded in ships' meteorological logbooks were originally extracted by hand into appropriate data books but with the gradual increase of the Observing Fleet this method was found to be very slow and laborious. On Captain Brooke Smith's attention being drawn by his scientific officer to the possibility of using Hollerith machines to extract the data he was quick to grasp its significance with the result that the Hollerith method of data extraction was introduced in the Marine Branch in 1921. Without this foresight it would have been impossible to make the computations necessary for the meteorological atlases of all oceans which were produced and found so valuable during the recent war.

Captain Brooke Smith also wrote and published a manual especially for the use of seamen, entitled *A Handbook of Weather Currents and Ice*, which has been largely used by masters and officers in the Merchant Navy. A Younger Brother of Trinity House, he was promoted to Captain, Royal Naval Reserve, in 1923. He was also a Founder Member of the Honourable Company of Master Mariners. He retired from the Meteorological Office in December, 1938, on reaching the age of 60. During the whole of his 19 years' service as Marine Superintendent he worked unremittingly to achieve the aim which he had so much at heart—to assist seamen to make themselves proficient in the application of meteorology and sea-surface current information in the interests of safe and economical navigation from day to day.

Both the Meteorological Office and his brother seamen owe much to the work of one who was himself, first and foremost a practical seaman, proud of his profession and zealous in advancing its standard of attainment in every way. His passing will be deeply regretted by all who knew him. Our deepest sympathy is extended to Mrs. Brooke Smith and family in the loss they have sustained.

J. H.

PERSONNEL

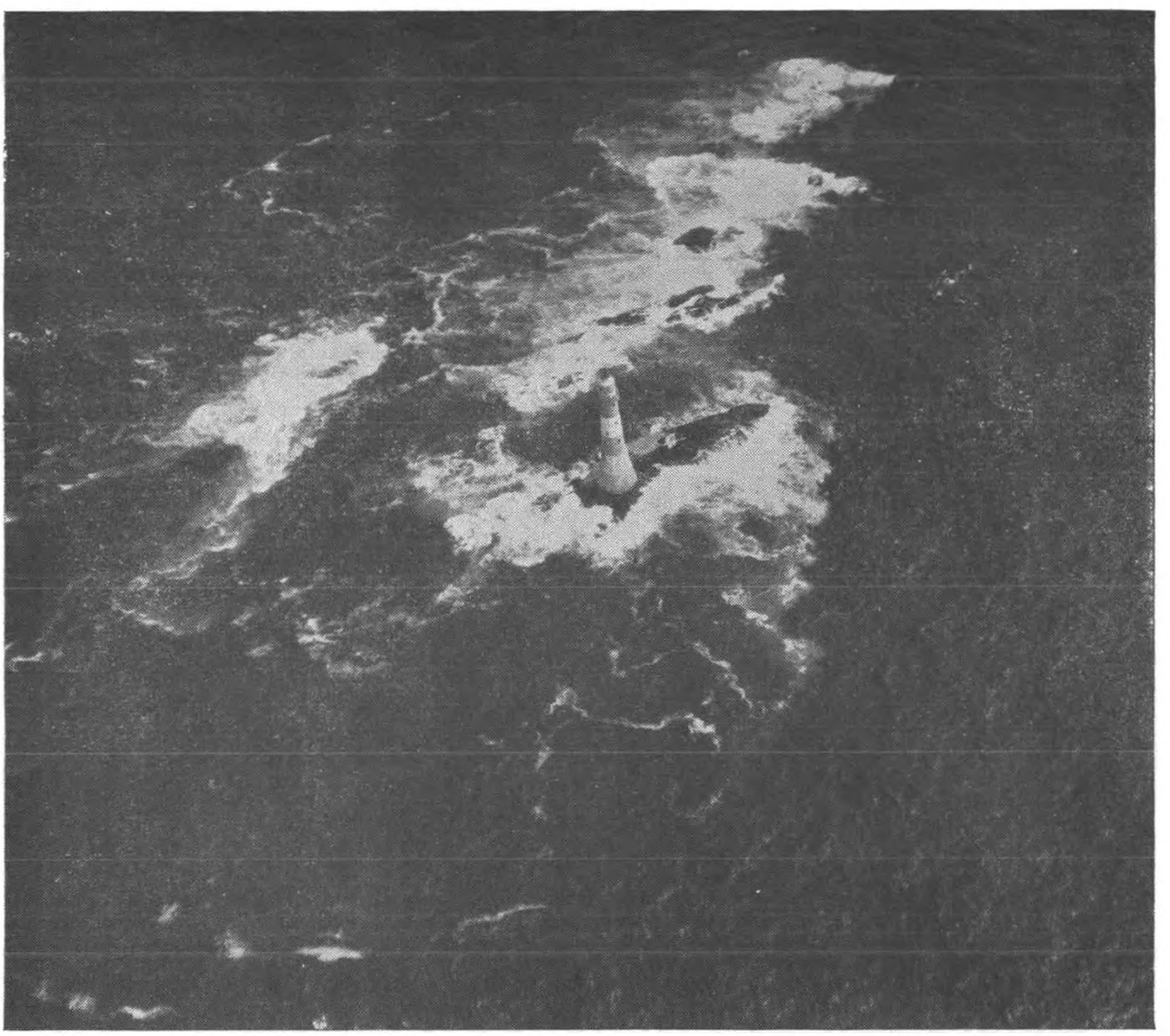
RETIREMENT.—CAPTAIN CHARLES FOX, C.B.E., Commodore of the Orient Line, retired on 31st December, 1950. He was born in 1890, and went to sea in 1905 in the ships of Charles Barrie of Dundee, and later in the Britain Steamship Company. During the 1914–18 War he served in the Royal Navy as a Lieutenant, R.N.R., mainly in command of minesweepers.

After the war, in 1919, he joined the Orient Line and was for a time troop officer in the *Huntsgreen*. Promoted through the various ranks in several of the Company's ships, he was appointed Staff Commander of the *Orama* in 1933 and in 1937 obtained command of that ship. Later he commanded the *Ormonde*, *Orford* and *Orcades*, and was in the last named, then the newest ship in the Company, when she was attacked and sunk by a submarine in the South Atlantic in 1942. For his efforts on that occasion he was made a C.B.E. and received Lloyds War Medal.

Since the war Captain Fox has commanded the *Orion* and the new *Orcades*, succeeding Captain Sir Arthur Baxter as Commodore in 1949. For many years the ships under his command have been associated with the Meteorological Office as observing ships. We wish him health and happiness in his retirement.

C. H. W.

LIGHTHOUSES OF THE BRITISH ISLES



THE SMALLS

The Smalls, a group of low rocks, form the northern point of entrance to the Bristol Channel in Lat. 51° 43′N. Long. 5° 40′W. The lighthouse stands on the north-western and largest of the group, and exhibits a light at a height of 126 feet above sea level.

FLEET LIST (Great Britain)

VOLUNTARY OBSERVING SHIPS

The following is a list of British ships voluntarily co-operating with the Marine Branch of the Meteorological Office.

The names of the Captains, Observing Officers and Senior Radio Officers are given as ascertained from the last written returns received. The date of receipt of the last return received is given in the third column.

All returns received from observing ships will be acknowledged, direct to the ship, by the Marine Superintendent.

The Port Meteorological Officers and Merchant Navy Agents at the ports will make personal calls on the Captains and Observing Officers as opportunity offers, or on notification from the ship at any time when their services are desired. (See under Notices to Marine Observers.)

Excellent awards are made at the end of each financial year. The names of the Captains, Principal Observing Officers and Senior Radio Officers gaining these awards are published in a special list in *The Marine Observer*.

It is requested that prior notification of changes of service, probable periods of lay-up, transfer of Captain, or other circumstances which may prevent the continuance of voluntary meteorological service at sea, may be made to the appropriate Port Meteorological Officer or Merchant Navy Agent.

Captains are requested to point out any errors or omissions which may occur in the list.

Selected Ships

Name of Vessel	Call Sign	Last Return Received	Captain	Observing Officers	Senior Radio Officer	Owners/Managers
Accra	GJSW	21.11.50	A. G. Baptiste, O.B.E.	R. Munro, N. Price, R. S. Elliott	J. A. Stuart	Elder Dempster Lines, Ltd.
Afghanistan	GNYB	8.5.50	W. A. Chappell	R. B. Arthur, S. W. Jones, J. Cummings	T. M. Murphy	F. C. Strick & Co., Ltd.
African Queen	ZBCY		A. Noble	W. H. Eardley		Colonial Development Corporation
Ajax	GJXM	18.3.50	P. Cross	E. B. Bertelsen, S. Barbour, N. Robertson, H. Bowers, D. S. Moreby	W. Akhurst	A. Holt & Co.
Akaroa	GMLP	1.5.50	J. Steele	H. P. Last, A. R. Stephenson, G. K. Lowis	J. W. Soulsby	Shaw, Savill & Albion Co., Ltd.
Alcantara	GLQR	1.5.50	H. D. Hooper	J. Fulford, R. Frizell, J. Gunns	R. E. Hammond	Royal Mail Lines, Ltd.
Alcyone Fortune	MAQC		F. Osler, M.B.E.	J. L. Paine, J. Blackburn	R. Dolby	Alcyone Shipping Finance Co., Ltd.
Amakura	MCPN	18.8.50	A. J. Carter	R. Halliday, T. Jones, L. Hamer	I. R. Davies	Booker Bros., McConnell & Co., Ltd.
Amastra	GYDD	23.1.50	R. Ashby Todd	R. Hedley, C. Close, J. Bizzey	R. Dunne	Anglo-Saxon Petroleum Co., Ltd.
Amersham	GNTQ	14.7.50	A. Spence	T. Brand, E. T. Ward, D. Fraser	J. Brown	Thompson S.S. Co., Ltd.
Andes	GQCV	1.1.51	G. A. Bannister	R. D. Jones, L. Black, W. Wheatley, F. M. Dickenson, B. Sugden	W. Smith	Royal Mail Lines, Ltd.
Apapa	MACE	8.12.50	J. J. Smith	R. G. Williams, C. A. Smith, W. Carroll, F. S. Jenkins	R. F. Barrett	Elder Dempster Lines, Ltd.
Arabia	GLKF	8.7.50	J. Chapman, R.D., R.N.R.	K. D. A. Lamb, K. T. Jones, P. Brush	B. A. Long	Cunard Steam Ship Co., Ltd.
Arabistan	GCKK	21.3.50	E. J. Cooke	—. Calvert, T. Dumont	W. Davies	F. C. Strick & Co., Ltd.
Araby	GMZL	29.8.50	T. W. Bolland	P. J. Robinson, G. A. Wright, M. G. Boyd	A. J. Cumming	Royal Mail Lines, Ltd.
Arakaka	GDVN	5.8.49	A. A. Gerard	D. Douglas-Kerr, C. Nolan, P. M. Flower	J. A. Davis	Booker Bros., McConnell & Co., Ltd.
Argentina Star	GTKF	18.10.50	E. R. Pearce, O.B.E.	E. R. Hope, A. G. Smith, M. J. Slessor, R. Robertson	—. McBride	Blue Star Line, Ltd.
Argyll	GBWB	18.10.50	A. W. Fielding	W. Hall, E. Johnson, L. Lumley	J. J. Smith	B. J. Sutherland & Co., Ltd.
Ariguani	GMBL	31.10.50	G. S. Gracie	R. D. Philpott, P. Furnival, D. Morris	A. N. Taylor	Elders & Fyffes, Ltd.
Armadale	GMCR	4.8.50	E. J. Ridout	W. L. Babbs, G. M. Leggate, J. Baxter, G. C. Evidge	N. Gray	Trinder, Anderson & Co.

Name of Vessel	Call Sign	Last Return Received	Captain	Observing Officers	Senior Radio Officer	Owners/Managers
Arundel Castle	GCZL	28.9.49	C. G. Gorringe	R. T. Jacques, I. C. Macpherson, —. Norman	E. Pitt	Union Castle Mail S.S. Co., Ltd.
Ascania	GKNJ	28.11.49	J. V. Locke, R.D., R.N.R.	G. L. Mitchell, N. R. Haddon, G. H. Griffiths	M. O'Donnell	Cunard Steamship Co., Ltd.
Ashburton	GNJN	7.12.50	R. Willcocks	J. Stenhouse, H. T. O. Fuller	B. L. McCoy	Trinder, Anderson & Co.
Asia	GLJV	23.1.50	B. Harrison	M. T. Dodds, D. J. Steff, P. King, R. Parry	W. J. Rainey	Cunard Steamship Co., Ltd.
Assyria	GGKX		G. H. Morris	P. Miller, M. Forster, R. J. M. Manson		Cunard Steamship Co., Ltd.
Asturias	GLQS	13.2.50	H. G. Whittle, O.B.E.	—. Lawson, —. Morganti, —. Edwards, K. M. Cutler	—. Hunt	Royal Mail Lines, Ltd.
Athelchief	GCRG	16.1.50	J. H. Flockhart	R. V. Parkiss, N. Jones, A. Green	W. Bradbury	Tankers, Ltd.
Athelregent	GQWL	4.1.50	J. A. Russell	R. Nicholson, R. McGregor, W. H. Buckle	A. Williams	Athel Line, Ltd.
Athenic	GBLS	4.8.50	B. Forbes-Moffatt	W. A. Hutchison, P. G. Clifford, J. K. Mudd	D. Haggart	Shaw, Savill & Albion Co., Ltd.
Athlone Castle	GYTK	3.10.50	C. C. Page	J. Pither, F. J. Pigeon, A. S. Pellow	J. H. Summers	Union Castle Mail S.S. Co., Ltd.
Atlantis	GLTM	21.11.50	A. R. Osburn	J. F. Anderson, M. Bialowski, J. Upton, J. Chester	H. Mathews	Royal Mail Lines, Ltd.
Auricula	GKPV	2.6.50	H. Sangster	H. Young, C. Eastwood, M. Lee	R. Davies	Anglo-Saxon Petroleum Co., Ltd.
Australia Star	GYCS	19.6.50	G. M. Duff, G.M.	K. C. Crompton, T. H. Ireland, M. R. Harry	L. Cooper	Blue Star Line, Ltd.
Australind	GJKF	21.12.50	J. F. Wood	D. Ewan, J. H. C. Looker, M. Campbell	R. Brown	Trinder, Anderson & Co.
Avondene	MAWG	14.6.50	W. L. Hall	J. R. Dixon, R. L. Jones	J. Smallwood	Dene Shipping Co., Ltd.
Balaena	GLDG		P. Virik			United Whalers, Ltd.
Balantia	GBMN	29.8.50	C. C. Dingle	D. B. Keefe, W. C. L. Sturrock, B. Y. Harrison, R. L. Collins	K. Arthur	Royal Mail Lines, Ltd.
Baltara	GTXM	4.1.49	G. E. Thomas	E. E. R. Roberts, R. E. G. Simmons, —. Davies, —. Morgan	C. James	United Baltic Corporation, Ltd.
Baron Elphinstone	GCCD		S. Williams	A. Campbell		H. Hogarth & Sons
Baron Maclay	GKXW	5.6.50	J. Reid	J. S. Cameron, J. W. Cameron, W. O'Neill	J. Hopkins	H. Hogarth & Sons
Beaverburn	MAGB	20.3.50	J. B. Smith, O.B.E.	G. W. R. Graves, T. F. Hercus, W. C. Halliday, P. A. Le Patourel	T. Ainsworth	Canadian Pacific S.S., Ltd.
Beavercove	GNLX	20.12.49	D. Parsons, R.D., R.N.R.	—. Miller, J. Jones	J. A. McAskill	Canadian Pacific S.S., Ltd.
Beaverdell	GBBS	22.9.50	N. C. H. Scallon, R.D., Cmde., R.N.R.	G. Bateman, G. Palmer, S. H. Fraser	L. Norton	Canadian Pacific S.S., Ltd.
Beaverford	MQJG	8.7.50	R. A. Leicester, O.B.E.	E. R. Connerton, A. Morrell, J. Edwards, D. Wallace	W. L. Poingdestre	Canadian Pacific S.S., Ltd.
Beaverglen	GBCP	6.2.50	J. Soame	—. Walgate, R. Savage, J. Jones, P. Ainsworth	R. Burch	Canadian Pacific S.S., Ltd.
Beaverlake	GBCQ	14.3.50	C. L. de H. Bell, D.S.C., R.D., Capt., R.N.R.	R. Savage, B. Snell, M. H. Scott, T. Sargent	W. Chick	Canadian Pacific S.S., Ltd.
Beckenham	GCGK	18.1.50	D. Cameron	G. T. Sharpe, W. Gibson, M. G. King	A. W. T. Camp	Watts, Watts & Co., Ltd.
Benarty	GCZZ	14.3.50	D. S. Sinclair	M. J. Peyton-Bruhl, A. King, J. Bain, G. M. Gall	R. Dixon	W. Thomson & Co.
Bendoran	MYSF	28.11.50	H. F. Masson	J. L. Forsyth, W. Watson, J. Wisden	J. E. Kemp	W. Thomson & Co.
Benmhor	GDVV	22.5.50	J. P. Robertson	J. B. Butterworth, K. Wilson, P. Shiels	P. V. Richmond	W. Thomson & Co.
Bennevis	MAGG	30.12.49	T. M. Blaikie	—. Forbes, A. Hall, M. Mathie	A. Pagan	W. Thomson & Co.
Benreoch	GDJT	13.4.50	J. B. Hastie	D. A. Ross, R. McPhee, J. Shields	I. M. Fraser	W. Thomson & Co.
Benvannoch	GCDZ	6.1.51	A. M. Robertson	J. Clements, R. G. Faulkner, J. Ritchie	E. Carruthers	W. Thomson & Co.

Benvrackie	GBTZ	21.11.50	W. O. Atkinson	P. Angus, N. J. Mackie, J. S. Lindsay	J. L. Wells	W. Thomson & Co.
Benwyvis	MYPW	26.1.49	K. Hardie	E. N. Stone, G. Speirs, G. K. Harrison	J. Whyman	W. Thomson & Co.
Biscoe	GDCW		D. Cornwell			Hector Tankers, Ltd.
Boynton Wyke	GBZV		G. Clixby			West Dock Steam Fishing Co., Ltd.
Brasil Star	GTLF	15.11.50	G. Barnard	J. T. Thompson, M. Harry, G. Marsh	E. Whitehead	Blue Star Line, Ltd.
Bravo	GLDZ	14.11.50	H. Hill	F. Barnes, G. Snowden, R. Martin	R. Newton	Ellerman's Wilson Line, Ltd.
Brisbane Star	GZCJ	21.12.50	S. Foulkes	A. Lewin, W. Bowie, J. Harris, A. H. White	R. G. Thomson	Blue Star Line, Ltd.
Britannic	GDXF	1.1.51	R. G. Thelwell, O.B.E., R.D., R.N.R.	G. K. Westerman, B. O'Brien, G. L. Mitchell, —. MacAlister	J. R. S. Kidson	Cunard Steamship Co., Ltd.
British Colonel	GFDB	11.1.50	H. J. Saddler	L. Ashburn, J. MacKay, D. H. Henderson	P. Murray	British Tanker Co., Ltd.
British Endeavour	GFCN		J. E. Stead	J. Irvine		British Tanker Co., Ltd.
British Endurance	MLZM	29.12.47	W. Watkin Thomas, O.B.E., D.S.C.	A. D. Millar, S. H. Falconer, P. C. Coyne	A. E. Adams	British Tanker Co., Ltd.
British Energy	GLBK	3.3.50	R. Smyth	A. Davies, J. A. Frost, D. P. Monaghan	N. Holdridge	British Tanker Co., Ltd.
British Escort	GCRB	13.4.50	H. H. Burke	J. A. G. Millar, S. A. Sanderson, F. Darby	A. V. Murray	British Tanker Co., Ltd.
British Hussar	GJVR	8.5.50	R. Phillips	A. R. Tuckett, G. W. Reeve, D. E. Ritchie	D. Glen	British Tanker Co., Ltd.
British Lancer	MAGS	8.5.50	F. S. Hall	K. W. Nicholls, A. D. Browne, J. E. Wynn	W. Brownlie	British Tanker Co., Ltd.
British Marquis	GWVL	31.10.50	C. W. Wall	R. L. Ramsay, J. Clarke, D. W. Banks	A. C. Martin	British Tanker Co., Ltd.
British Patience	GUFF	2.6.50	W. Jackson	R. D. Smithsons, G. Lewis, W. Turner	A. Roberts	British Tanker Co., Ltd.
British Pilot	GCQT	20.9.50	J. H. Nelson	B. N. Jarvis, J. Forrest, I. M. Ferrier	M. G. Rodger	British Tanker Co., Ltd.
British Piper	GDNN	25.4.50	J. P. M. Samson	J. Picken, B. H. Moore, G. R. Gray	L. Trestrail	British Tanker Co., Ltd.
British Power	GZGG	15.10.48	K. M. Mitchell	A. Fraser, P. F. Mason, E. C. Ford	F. G. Rimmington	British Tanker Co., Ltd.
British Resource	GFCD	14.11.50	J. C. Lea, O.B.E.	G. Symon, R. I. S. Elder, P. D. Fitchew	V. Dalton	British Tanker Co., Ltd.
British Statesman	GJNR	21.12.50	A. H. Newby	G. Symons, J. A. Lamb, J. Archibald	A. V. Couser	British Tanker Co., Ltd.
British Swordfish	GCQV					British Tanker Co., Ltd.
Brittany	GMZS	14.11.50	H. A. Wright	C. Ratcliff, D. Guinness, B. A. Wood, J. C. Derby	P. Mahoney	Royal Mail Lines, Ltd.
Brockleymoor	GDWP	26.11.49	D. J. Jones	F. K. Venus, W. Pattison, J. S. Clarke	N. W. Hodgson	Walter Runciman & Co., Ltd.
Byron	GNFL		J. Byrne	M. F. Fair, W. A. Sparks, P. Moulds	—. Pryor	Lamport & Holt Line, Ltd.
Cairnavon	GPJN	24.7.50	J. W. Scott	C. Sutherland, C. Percy, J. Holland, J. Lobban	W. P. Greaves	Cairns, Noble & Co.
Cairnesk	GMKR	1.5.50	I. G. Foster	J. Hogg, A. W. Watts, G. Makin, W. Fraser	E. Johnston	Cairns, Noble & Co.
Cairnvalona	GQKM	5.9.50	G. R. Norvell	N. E. Forth, R. R. Campbell, D. Prudham	T. W. Lawson	Cairns, Noble & Co.
Caledonia	GCKR	5.9.50	E. J. Stormont, M.B.E.	T. L. Langlands, D. Barclay, A. Macadam	S. J. D. Taylor	Anchor Line, Ltd.
Canton	GDDT	24.7.50	G. Stable	E. T. Griffiths, M. Connell, M. D. Pearey	J. R. C. Johnson	Peninsular & Oriental Steam Navigation Co.
Capetown Castle	GKGM	1.1.50	J. McReynolds, D.S.C.	E. Holden, E. H. T. Pickles, G. John	J. Gilbart	Union Castle Mail S.S. Co., Ltd.
Cape York	GCZS	19.1.50	C. A. Jones	J. Fairgreaves, J. Macleod, J. Bruce	S. Gracie	Lyle Shipping Co., Ltd.
Carlton	GIFE	20.4.49	K. Wardale	A. Dodd, W. A. Morriss, A. A. Abdullah	J. Park	R. Chapman & Son
Carnarvon Castle	GJSL	17.1.51	J. F. Oakley	D. Leitch, A. Backhouse, C. R. Kelso	W. Brown	Union Castle Mail S.S. Co., Ltd.
Caronia	GYKS	21.12.50	D. W. Sorrell	I. Bryce, P. Jolliffe, R. T. Ibbotson, J. A. P. Matthews	G. M. Parsons	Cunard Steamship Co., Ltd.
Carthage	GRNX	12.8.50	E. R. Bodley, D.S.O.	D. Parsons, R. A. Gibbons, B. B. Jones	W. H. Chick	Peninsular & Oriental Steam Navigation Co.
Caslon	MCJR	13.4.50	J. M. Cherry	P. F. Carnochan, L. C. Burton, F. J. Hamilton	J. McKenzie	Runciman (London), Ltd.
Cavina	GKFV	8.7.50	T. H. Bull	J. Nicholson, G. L. Foster, N. Abbot	E. A. Loft	Elders & Fyffes, Ltd.
Caxton	GCDX	19.1.49	R. J. Longley	F. Hamilton, R. Crawford, J. G. Wilson, E. Bromfield	A. Austin	Runciman (London) Ltd.
Ceramic	GFLM	29.8.50	A. V. Richardson	T. de M. Ogier, B. H. Clarke-Lens, L. M. Howells	H. V. Littlecot	Shaw, Savill & Albion Co., Ltd.
Cerinthus	GCRM	8.7.50	J. F. Auld	B. P. Payling, D. W. Alford	F. O. Holt	Houlder Bros. & Co., Ltd.
Cheshire	GLXV	14.7.50	P. H. Potter	A. Cameron, J. R. Longrigg, A. Ditchfield	J. L. Banks	Bibby Bros. & Co.

Name of Vessel	Call Sign	Last Return Received	Captain	Observing Officers	Senior Radio Officer	Owners/Managers
Chitral	GLKN	25.11.49	G. C. Forrest, R.D., Cmde., R.N.R.	J. Chester, E. Snowden, J. A. Lefevre	A. R. Porter	Peninsular & Oriental Steam Navigation Co.
Cilicia	GDGL	6.1.51	R. Blake	J. Henderson, J. C. Ballantyne, D. Miller	M. O'Donnell	Anchor Line, Ltd.
Cingalese Prince	GFRC		J. D. Fraser			Prince Line, Ltd.
City of Barcelona	GTKR	8.12.50	N. Groundwater	W. E. James, J. W. Edwards, R. E. Greenwood	G. M. Cubbings	Ellerman Lines, Ltd.
City of Bristol	GCPN	7.12.50	T. F. Symons	A. G. Hine, D. R. Townson, J. A. Buchanan	D. Laing	Ellerman Lines, Ltd.
City of Calcutta	GLYX	6.2.50	H. Johnson	D. Wardlaw, D. Campbell, D. McKinnon	H. Elder	Ellerman Lines, Ltd.
City of Cape Town	GBBQ	21.4.50	W. R. Pinchbeck	W. S. Fletcher, P. Redhead, F. Smith	D. S. Crombie	Ellerman Lines, Ltd.
City of Carlisle	GBJK	12.10.50	W. A. Hannah, O.B.E.	J. Ingoldsby, H. Swinney, I. B. Taylor, M. Langram	D. Vernall	Ellerman & Bucknall S.S. Co., Ltd.
City of Chester	MAHN	8.7.50	E. M. Robertson	P. Appleton, V. W. Pinnington, N. Paskin	J. Moran	Ellerman Lines, Ltd.
City of Delhi	GLBW	8.11.49	J. W. Wotherspoon	J. P. Mason-Price, I. Irvine, W. Smith	A. Dennis	Ellerman Lines, Ltd.
City of Derby	GFWC	30.8.49	G. J. Law, O.B.E.	R. Tyrrel, J. Twomey, R. Huntingdon	R. Macdonald	Ellerman Lines, Ltd.
City of Dieppe	GSVQ	18.8.50	E. G. Chapman	J. Thompson, E. G. A. Smith, L. Aspinall	K. Allies	Ellerman Lines, Ltd.
City of Durham	GBJM	1.9.50	H. G. Williams, O.B.E.	M. F. Ayers, D. S. Taylor, A. I. Crossland	H. Wilson	Ellerman Lines, Ltd.
City of Evansville	GJNF	28.11.50	A. M. Westlake	—. Heywood, K. Jones, A. R. Quigley	J. Arnold	Ellerman Lines, Ltd.
City of Johannesburg	GBKW	1.1.51	W. H. Matheson, O.B.E.	R. B. May, H. Lewis, P. W. Appleton, J. I. Owen	A. R. Henderson	Ellerman Lines, Ltd.
City of Khartoum	GBZC	14.6.50	G. D. Robertson	C. P. Bradbury, C. T. Heywood, J. B. Lister, R. F. Moon	R. Greenhalgh	Ellerman Lines, Ltd.
City of Lille	GSLN	14.11.50	W. A. Owen	R. H. Bellhouse, W. H. Holden, J. B. Jones	R. Smith	Ellerman Lines, Ltd.
City of Lyons	GMCN	27.10.50	G. A. Ring	L. H. King, K. C. Powell, F. More	C. Pollitt	Ellerman Lines, Ltd.
City of New York	GLYQ		S. L. Hoare, O.B.E.			Ellerman Lines, Ltd.
City of Paris	GFQM	8.7.50	H. Percival, O.B.E., R.D., Cmde., R.N.R.	D. Dick, I. S. McGregor	B. J. Holyoake	Ellerman Lines, Ltd.
City of Pretoria	GBLN	14.11.50	R. Longstaff, D.S.C.	J. Salt, F. Braddick, J. P. James, I. McBeath	J. Booth	Ellerman & Bucknall S.S. Co., Ltd.
City of Swansea	GBZT	17.3.50	M. L. Hernan, M.B.E.	E. G. O'Driscoll, J. A. Whieldon, E. N. Williams	W. Bateman	Ellerman Lines, Ltd.
City of Sydney	GSFM	24.8.49	H. Johnson	B. Walker, J. Blanch, E. E. Cooper	H. D. Smythe	Ellerman Lines, Ltd.
City of Tokio	GFMW	6.1.51	G. F. Sumpton	L. Boundy, M.B.E., E. G. J. Roberts, A. Oxberry	F. McTighe	Ellerman Lines, Ltd.
City of Windsor	GJYR	17.1.51	T. L. Vaughn	H. Lewis, E. Percy, S. Hughes	P. O'Maloney	Ellerman & Bucknall S.S. Co., Ltd
Clan Brodie	GKPD	28.3.50	B. Vernon-Browne	J. Jones, S. F. Nicholson, K. A. Kerr, I. A. W. Williamson	W. M. Morrison	Cayzer, Irvine & Co., Ltd.
Clan Buchanan	GKNM	1.7.50	J. Forster	S. W. Brown, T. N. Geesin, J. M. Brackenbridge	J. H. Wright	Cayzer, Irvine & Co., Ltd.
Clan Campbell	GDZK	4.1.49	A. Macintyre	C. C. Atkinson, W. Muir, W. Dilks, J. Stormont	R. F. Cole	Cayzer, Irvine & Co., Ltd.
Clan Chattan	GFBX	27.1.51	E. H. Stone	E. Cox, G. A. Berry, R. S. Schooling, P. A. MacNiven	E. Shillabeer	Cayzer, Irvine & Co., Ltd.
Clan Chisholm	GFBY	27.2.50	R. B. Linsley	R. D. Helm, D. L. Godfrey, A. G. Allson, J. A. Lionnet	J. A. Gray	Cayzer, Irvine & Co., Ltd.
Clan Davidson	MAWU	3.10.50	H. J. Anchor, O.B.E., R.D., R.N.R.	H. Lockyer, I. W. Bennett, M. J. Skillington	J. E. Appleton	Cayzer, Irvine & Co., Ltd.

Clan Forbes	GPGB	25.1.51	W. R. Woodriffe	D. de Vall, J. S. Cumming, J. S. Catteral	W. G. Peddie	Cayzer, Irvine & Co., Ltd.
Clan Macaulay	GZCS	12.7.49	A. G. Storkey	T. R. Halliday, J. Arnot, D. S. Clark	J. Ormerod	Cayzer, Irvine & Co., Ltd.
Clan Macdonald	GCPG	17.1.51	H. Cater	A. H. Banks, A. M. Vaughan, J. Walker	G. Martyn	Cayzer, Irvine & Co., Ltd.
Clan Macdougall	GFBQ	27.1.51	P. McMillan	S. R. J. Woods, D.S.C., R.D., Cdr. R.N.R., J. A. Molyneux, D. J. Milner, D. E. Thomas	C. E. C. Crew	Cayzer, Irvine & Co., Ltd.
Clan Maclaren	GSSC	19.1.51	A. Redford, Capt., R.N.R.	A. L. Pitts, D. Richards, K. Morton	R. W. Moore	Cayzer, Irvine & Co., Ltd.
Clan Macnair	GFNK	17.1.51	J. P. Dunphy	R. Shattock, W. Kenyon, —. Campbell	—. Dees	Cayzer, Irvine & Co., Ltd.
Clan Macneil	GFWP	18.4.50	J. West	G. Rowland, B. Edwards, A. P. Sweeny	A. Gordon	Cayzer, Irvine & Co., Ltd.
Clan Macrae	MAHP	17.3.49	E. Coulthart	J. D. W. Chapple, T. Aitchison, J. Nichols	W. Bryce	Cayzer, Irvine & Co., Ltd.
Clan Mactavish	GUBB	14.11.50	A. MacIntyre	G. B. Owen, S. M. Grant, G. A. Dubery, R. Cook	W. A. Ellmers	Cayzer, Irvine & Co., Ltd.
Clan Shaw	GBYW		R. P. Galer, C.B.E., R.D., Capt., R.N.R.	A. Tyrrell		Cayzer, Irvine & Co., Ltd.
Clan Urquhart	GFBK	17.4.50	T. W. Inman, O.B.E.	W. Graham, M. N. Ure, A. D. Rumble	A. F. McIntyre	Cayzer, Irvine & Co., Ltd.
Clearpool	MAHQ	14.6.50	J. Whamond	G. Ratcliffe, I. H. Isaac, A. Pringle	R. R. Bromham	Sir R. Ropner & Co., Ltd.
Clydebank	GKLM	22.5.50	J. E. Allen	B. H. Smith, A. R. Howson, E. A. D. Vargas	A. G. Roberts	Andrew Weir & Co., Ltd.
Clydefield	GSNK	21.11.50	H. V. Jones	G. S. Barker, G. Harrison	J. Layton	Hunting & Son, Ltd.
Columbia Star	GQGT	13.4.50	D. J. Stratta	F. C. T. Wood, D. E. Ortner, D. B. Wright, W. A. R. James	A. Etheridge	Blue Star Line, Ltd.
Comliebank	GKLJ	1.6.49	J. Townsley	A. J. Whiston, A. Brown, E. J. Stoddart	R. Holding	Andrew Weir & Co., Ltd.
Condesa	MAHU	21.11.50	H. Heal	R. Tinmouth, S. J. Edgington, N. England	J. S. Bishop	Furness-Houlder Argentine Lines. Ltd.
Consuelo	GCGQ	28.12.50	H. Greenhill	D. J. C. Martin, R. Ball, P. Ramsay	T. Goodman	Ellerman's Wilson Line, Ltd.
Corfu	GRNW	13.4.50	F. Ferraby	K. H. S. Renshaw, D. M. Johnstone, J. R. Neale, N. R. Lewis	J. T. Macdonald	P. & O. Steam Navigation Co.
Corinthic	GZYL	12.10.50	G. M. Robertson, D.S.C.	H. A. Howe, G. B. Broom, R. G. G. Adams, D. M. Mortimer	A. W. Allen	Shaw, Savill & Albion Co., Ltd.
Corrientes	GFPT	28.12.50	W. Anderson	R. MacAuley, D. B. Langwell, J. H. Stark	W. Vaughan	Donaldson Bros. & Black, Ltd.
Craftsman	GPZT	17.4.50	W. F. O'Neill	W. E. Williams, W. C. Stoddart, F. L. Steele	P. Goulden	T. & J. Harrison
Cumberland	GPPY	30.7.50	J. Oxnard	M. Heron, R. B. C. Brown, R. Gandy	W. Sykes	Federal Steam Navigation Co., Ltd.
Daleby	MFBV		J. Kenney			Ropner Shipping Co., Ltd.
Dallas City	GCLS	29.6.50	C. E. Exton	T. W. D. John, N. C. Pascoe, A. M. Robson	H. Christianson	Sir William Reardon Smith & Sons Ltd.
Darro	MAID	30.12.49	T. Powell	T. Buckney, M.B.E., R. J. Kistler, K. Bolland	J. B. Smith	Royal Mail Lines, Ltd.
Debrett	GRPR	18.10.50	W. Gillespie	H. M. Bunker, I. Pritchard, H. T. Cunliffe	W. Miller	Lamport & Holt Line, Ltd.
Deebank	GTDB	22.5.50	B. Rivett	G. T. Clarke, R. Clarke, J. A. North	A. A. Macpherson	Andrew Weir & Co., Ltd.
Defoe	GNWF	14.11.50	W. C. Blake	K. Maguire, D. S. Leicester, J. G. Miles	J. E. Pickering	Lamport & Holt Line, Ltd.
Delane	MMNW	11.1.49	H. Pratt	B. M. Metcalfe, R. Baldwin, C. T. Skrastin	J. Care	Lamport & Holt Line, Ltd.
Delilian	GJSQ	18.10.50	R. McNie	W. S. Kerr, A. T. Johnston, S. C. Macdonald	W. J. Read	Donaldson Bros. & Black, Ltd.
Delius	GZSY	5.10.49	A. W. Mitchell	W. Jones, A. Bennett, B. Walker, J. Garcia	R. Pryer	Lamport & Holt Line, Ltd.
Denbighshire	GQGW	28.12.50	J. Simpson	C. Goodman, D. Hayward, T. White, M. Davies	G. A. Heapy	Glen Line, Ltd.
Derryclare	GCKN	20.7.50	N. Bellwood	M. W. Drew, J. Parish	F. B. Bowles	McCowen & Gross, Ltd.
Derryheen	MAIF	28.11.50	J. Robinson	J. McLean, R. Williams, G. Patterson	J. Byrne	McCowen & Gross, Ltd.
Deseado	MAIH	28.11.50	S. J. G. Hill	J. Green, W. B. Baxter, P. C. T. Davies	I. S. Humphrey	Royal Mail Lines, Ltd.
Devis	GFKT	9.7.48	T. J. Sweeny	P. Casey, J. Bicknell, G. Trickey, J. Russell	J. Care	Lamport & Holt Line, Ltd.
Devon	GDRF	21.12.50	A. Hocken	G. Naylor, J. Weston, J. D. Hellings	J. Tomlinson	Federal Steam Navigation Co., Ltd

Name of Vessel	Call Sign	Last Return Received	Captain	Observing Officers	Senior Radio Officer	Owners/Managers
Devonshire	GTTV	17.1.51	A. Beharrel	A. R. Moore, P. R. De Witt, P. L. Armstrong, L. H. Sheldrake	G. Talbot	Bibby Bros. & Co.
Dilwara	GYQV	8.11.49	F. L. Sampson, D.S.C.	H. B. Cray, E. C. Plowman, R. B. Coates	S. J. Taylor	British India Steam Navigation Co., Ltd.
Discovery II	GWVM		J. F. Blackburn, D.S.O., Cdr., R.N. (retd.)			National Institute of Oceanography
Dominion Monarch	GRGG	1.1.51	Sir Henry Gordon, K.B., D.S.C.	G. Conolly, J. Theakeston, J. Hurst, S. H. Wilde, J. R. Sims, A. Baber	J. A. McAskill	Shaw, Savill & Albion Co., Ltd.
Dorelian	GJTL	5.12.49	D. MacQueen	A. J. Dougall, R. S. Hopkins, A. Arnott	R. Read	Donaldson Bros. and Black, Ltd.
Doris Clunies	MSLB	1.7.50	A. MacVicar	J. B. Whyte, K. M. Hamilton, —. Eelloo	H. A. Reynolds	Clunies Shipping Co.
Dorset	GZFQ		A. E. Williams			Federal Steam Navigation Co., Ltd.
Drina	MAIL	15.11.50	D. R. Miller	J. Fox, J. Street, N. Oliver, A. Nottage	A. Humphries	Royal Mail Lines, Ltd.
Dromore	GDSF	20.9.49	J. R. Moreby	J. McCool, S. N. Coe, R. W. Keene	R. H. Heard	Furness, Withy & Co., Ltd.
Dryden	MQFT	30.1.51	D. C. Roberts	K. Quirk, D. S. Leicester, I. Pritchard	P. Thompson	Lamport & Holt Line, Ltd.
Duke of Athens	GMYS	10.1.51	J. G. Lomas, A.I.N.A.	T. Walton, L. Labistour, N. Beattie, D. M. Stewart	T. P. Hobson	Trent Maritime Co., Ltd.
Dunedin Star	GKKT		J. C. W. Davies	R. R. Elliott		Blue Star Line, Ltd.
Dunkery Beacon	GUFS	14.11.49	L. E. Thomas	J. D. B. Wylie, A. J. Hawkes, D. W. Hobday	A. B. Ewart	Phs. Van Ommeren (London), Ltd.
Dunster Grange	GCSD	15.5.50	R. S. Grigg, O.B.E.	H. R. Neal, D. G. Bray, T. C. Mullings	T. Jones	Houlder Bros. & Co., Ltd.
Durango	MAIM	8.5.50	P. M. Burrell	T. Buckney, J. Pastill, R. Sly, J. Gunns, L. L. Hunter	W. Wilson	Royal Mail Lines, Ltd.
Durban Castle	GPGP	21.11.50	G. W. B. Lloyd	W. Reilley, —. Cutcliffe, D. A. Bird	H. A. Liggins	Union Castle Mail S.S. Co., Ltd.
Durenda	GFSL	21.11.50	A. H. Usher	H. R. Smith, D. A. C. Windle	T. Welsh	British India Steam Navigation Co., Ltd.
Durham	GWWK	8.5.50	R. J. Dunning	B. Applegate, J. T. Pettie, J. Sims, D. Hilliard	C. Robinson	Federal Steam Navigation Co., Ltd.
Eastern	GFTV	28.3.49	H. C. G. Stratford	D. Simon, D. Elkington, D. Grant	E. C. Bouel	Eastern & Australian S.S. Co., Ltd.
Edinburgh Castle	GOHN	17.4.50	T. W. McAllen	D. Evans, G. J. G. Francis, M. Gray	J. Hodgson	Union Castle Mail S.S. Co., Ltd.
Edward East	GYXZ		J. A. Whittleton			H. Croft Baker & Sons, Ltd.
Egidia	GJZD	21.12.50	J. L. Gibson, O.B.E.	W. B. Sawers, W. Hallum, R. Watt, H. M. Keenan	R. Hartley	Anchor Line, Ltd.
El Gallo	MAIP	24.4.50	S. J. Watts	T. Pearson, E. J. Morgan, J. Channing-Pearce	A. G. Pews	C. T. Bowring & Co., Ltd.
Elysia	GJZK	12.1.51	D. Barclay	J. T. Donald, A. McKendrick, N. M. Fletcher	W. H. Hier	Anchor Line, Ltd.
Empire Fowey	GMFW		D. G. Bailey	P. C. Reed, R. W. Eleanor, D. W. Lightbody, J. Howton	P. Maloney	P. & O. Steam Navigation Co.
Empire Halladale	GPVQ	28.11.50	J. McGill Brown	D. Lockhart, W. G. Creelman, R. McClay	J. N. Crogg	Anchor Line, Ltd.
Empire Martaban	GBSV	1.7.50	E. Pleasance	W. Mottram, S. McGillivray, J. Lewis	R. Charlton	Bolton S.S. Co., Ltd.
Empire Orwell	GRCB		A. C. G. Hawker, C.B.E., R.D., R.N.R.	D. K. Kinloch, J. B. Crichton, P. Byers	A. C. Shippam	Orient Steam Navigation Co., Ltd.
Empire Patrai	GDKL	5.8.49	C. L. Thomas	M. Uminsky	G. R. Stuart	Fenton S.S. Co., Ltd.
Empire Pride	MAJB	24.7.50	A. Williamson	J. G. Sleight, R. Hammond, B. Pennington	A. Mallett	Bibby Bros. & Co.
Empire Star	GCDP	28.10.49	G. E. Barnard	T. Hender, M. R. Bremberg, J. Edwards, P. Ellett	H. Smith	Blue Star Line, Ltd.
Empire Viceroy	MAJN	8.7.50	J. B. S. Bland	—. Brockwell, J. R. Dunstan, —. Crossley	—. Hagon	Pandelis Shipping Co., Ltd.

Empress of Australia	GFSB	21.12.50	C. E. Duggan, R.D., R.N.R.	R. A. Jones, D. Cluloy, P. A. T. Hargreaves, M. H. Scott	T. C. Mann ..	Canadian Pacific S.S., Ltd.
Empress of Canada ..	GSVR	28.11.49	J. P. Dobson, D.S.C., R.D., R.N.R.	G. A. N. Bezant, G. E. Mansell, J. Cuthbertson	J. M. Butterworth ..	Canadian Pacific S.S., Ltd.
Empress of France ..	GNTV	7.12.49	B. B. Grant, R.D., R.N.R.	J. Jeavons, J. Griffen, —. Murray ..	D. Murphy	Canadian Pacific S.S., Ltd.
Empress of Scotland	GMLV		E. A. Shergold	J. Richardson, J. Martin		Canadian Pacific S.S., Ltd.
Erodona	GZLQ		J. E. Gill			Anglo-Saxon Petroleum, Ltd.
Eros	GYSB	14.11.50	R. C. Vigurs	C. P. Turquand, J. A. Mills	P. McEwan ..	Elders & Fyffes, Ltd.
Esperance Bay ..	GSMP	7.12.50	T. V. Roberts, R. D., Capt. R.N.R.	G. S. Sheldon, R. G. Mossop, J. D. Rendel, J. K. Wyles	M. J. Sheeham ..	Shaw, Savill & Albion Co., Ltd.
Essex Trader ..	GCMS	12.1.51	D. G. Evans	D. A. Owen, E. H. Miles, D. Harris ..	R. Jones	Trader Navigation Co., Ltd.
Esso Edinburgh ..	GCQM	19.4.50	M. Rutherford	J. Leech, J. C. Young, D. Turtle ..	W. Whittaker ..	Esso Transportation Co., Ltd.
Esso Glasgow ..	GTXC	20.10.50	D. J. Davies	E. Shields, W. G. Gamlin, E. Shelton-Jones	P. J. Everett ..	Esso Transportation Co., Ltd.
Esso Plymouth ..	GYRX	14.11.50	O. H. Shepheard	A. Lindh, R. Sager, I. D. A. Mackintosh ..	R. Lowen	Esso Transportation Co., Ltd.
Eucadia	GJZL		D. Morrison	R. Crawford, J. Gorrie, D. Millar, C. Boyle	D. Sproat	Anchor Line, Ltd.
Explorer	GYJX	29.3.50	J. L. Curle	W. C. Johnstone, A. T. Baxendale, W. C. T. Pennant	B. Tallon	T. & J. Harrison
Fanad Head	GNQQ	14.11.50	W. A. Haddock, O.B.E. ..	E. C. Rae, C. R. Wilson, A. Davies ..	D. Lindsay	G. Heyn & Sons, Ltd.
Fordsdale	GSMW	6.1.51	T. H. Davies	H. G. B. Moss, J. L. Harrison, G. Main, A. Sparks	W. S. Money ..	Shaw, Savill & Albion Co., Ltd.
Francomia	GBRQ	1.7.50	C. B. Osborne, R.D., R.N.R.	J. S. Rowe, P. J. Mullan, E. D. Hall ..	J. L. Blanchard ..	Cunard Steamship Co., Ltd.
Fresno City	GBYD	28.12.50	W. V. Doughty	T. W. D. John, G. Groves, J. Robiliard ..	D. C. Edmunds ..	Sir William Reardon Smith & Sons, Ltd.
Fylingdale	GKSR	7.12.50	R. Coultas	W. W. Gatenby, W. T. Feather, N. Jameson	J. W. *Ellis*	Headlam & Son.
Geologist	GJMR	19.6.50	A. E. Jackson	S. Richardson, D. Hancock, J. Clarke ..	M. H. Whitehead ..	T. & J. Harrison
Georgic	GRLJ	28.9.49	C. S. Williams	G. H. Drinkwater, A. R. M. Graham, T. O'Sullivan, A. Leyland	A. G. Hill	Cunard Steamship Co., Ltd.
Glaucus	GDYZ	28.11.50	C. F. Lock	C. Y. Tao, C. H. Jolly, W. A. Cameron, D. Robinson	F. Devlin	A. Holt & Co.
Glenartney	GBLG	19.1.51	C. J. Tyler	I. Webster, I. N. Chalmers, H. M. MacFarlane	J. F. Wilson ..	Glen Line, Ltd.
Glenbank	GKLC	7.12.48	T. Fraser	W. Murphy, D. V. Hoskins	W. Lingbottom ..	Andrew Weir & Co., Ltd.
Glenorchy	GBLL	22.8.50	P. Cross	—. Hansell, D. Vossor	L. A. Tebbutt ..	Glen Line, Ltd.
Gloucester	MANK	8.5.50	N. L. Warren	F. C. Taylor, G. W. Wotton, J. Marshall ..	T. Herbert	Federal Steam Navigation Co., Ltd.
Golfito	GBYL	21.11.50	S. A. Sapsworth	R. A. Laycock, J. H. Payne, J. B. Hughes	R. W. Smith ..	Elders & Fyffes, Ltd.
Gothic	MAUQ		W. J. Williams			Shaw, Savill & Albion Co., Ltd.
Gracia	MANN	14.9.50	J. McInnes	I. M. Macfarlane, J. Watt, I. D. Barbour	G. Crighton	Donaldson Bros. & Black, Ltd.
Granford	MQGC		E. C. J. Morgan	W. Stoodly, A. R. Simpson, T. J. Dresh		Goulandris Bros. Ltd.
Haparangi	GJYX	29.6.50	C. R. Pilcher, O.B.E. ..	J. R. Ramsay, C. Burrill, R. S. Luly, E. Cooper	A. Williams	New Zealand Shipping Co., Ltd.
Harmatris	GTWP	4.8.50	A. R. Phelps	R. A. Brock, A. H. Barber, J. R. Woodfield	A. Astley	J. & C. Harrison, Ltd.
Helicina	GKBC	17.1.51	D. T. Keddie	H. W. Gostage, E. C. Barnes, J. B. Walker	M. O. R. Lynch ..	Anglo-Saxon Petroleum Co., Ltd.
Herdsman	GPZX	1.11.50	W. A. Short, O.B.E. ..	J. W. Embleton, K. Cobb, J. Cubbin, C. Arden	G. Whitiker	T. & J. Harrison
Herefordshire ..	GOFG	18.8.50	G.W. Dobson, R.D., R.N.R.	B. Pennington, J. Hughes, K. Allen ..	F. W. Greaves ..	Bibby Bros. & Co.
Highland Brigade ..	GJKN	6.2.50	A. N. Anderson	D. W. Buckle, D. N. G. East, L. H. Paine	W. Gay	Royal Mail Lines, Ltd.
Highland Chieftain ..	GCTY	22.5.50	W. H. Grimshaw, O.B.E. ..	M. Wardle, R. M. Box, R. D. H. Manley, J. M. C. McLoughlin, C. J. S. Morris	W. Rolonson ..	Royal Mail Lines, Ltd.
Highland Monarch ..	GMZF	16.9.50	S. J. G. Hill	E. Card, J. Hall, J. Rutter, K. Jones, C. Saddler	F. Dunk	Royal Mail Lines, Ltd.
Highland Princess ..	GFMN	7.10.49	W. H. Roberts	G. E. Leech, C. J. Gulleford, R. R. L. Williams, R. O. Hoskins, G. Gulson ..	F. G. Goodall ..	Royal Mail Lines, Ltd.

Name of Vessel	Call Sign	Last Return Received	Captain	Observing Officers	Senior Radio Officer	Owners/Managers
Hilary	GQVM	18.8.50	J. W. Binns, O.B.E.	S. Farmer, T. McMullan, K. McKenzie	T. Tyman	Booth S.S. Co., Ltd.
Himalaya	MCDY	28.11.50	H. C. C. Forsyth, R.D., Cmde. R.N.R.	G. C. Barrett, G. B. Thom, J. Crichton	F. E. Ash	P. & O. Steam Navigation Co.
Hinakura	GDVS		R. L. Warren	J. Stevens, A. F. Jenkins, J. Camping, T. Rolands	J. Braithwaite	New Zealand Shipping Co., Ltd.
Hororata	MANZ	28.12.50	E. H. Hopkins	M. C. Hardy, R. S. Hales, C. B. Hewitt	D. E. Hodding	New Zealand Shipping Co., Ltd.
Hubert	GFNW	23.6.49	J. Whayman, D.S.C., R.D., R.N.R.	T. E. Williams, D.S.C., R.D., Lt.-Cdr. R.N.R., K. Grayson, R. Soulsby	D. Swindon	Booth S.S. Co., Ltd.
Huntingdon	GFCT	25.1.51	A. J. Angell	J. J. M. Stratton, G. G. Pegler, M. J. Algar	F. Walls	Federal Steam Navigation Co., Ltd.
Hurunui	GJZF	17.1.51	H. E. Reilly, R.D., R.N.R.	F. Taylor, T. Rowland, J. Milner	C. Braithwaite	New Zealand Shipping Co., Ltd.
Inishowen Head	MAOC	20.2.50	R. A. Ferguson	J. Smyth, E. McIntosh, A. MacPhail	J. J. Dunne	G. Heyn & Sons, Ltd.
Interpreter	GPZY		H. Coates	W. E. Owen, I. Mitchell		T. & J. Harrison
Inverbank	GKML	21.7.49	A. F. King	G. Cheyne, A. Teale, A. Findlay	S. Dewsnap	Andrew Weir & Co., Ltd.
Jamaica Producer	VPLM	15.11.50	G. E. M. Jenkins	E. A. Whitaker, J. A. Whitehouse, S. R. Cattell	P. Graham	Kaye Son & Co., Ltd.
Jersey City	GIGA	2.8.50	D. W. Boutcher	G. Harvey, J. Groves, R. Goatley	R. Jelley	Sir Wm. Reardon Smith & Sons, Ltd
Jessmore	MAOF	5.6.50	G. Killick	P. V. McCullough, R. Martin, R. W. Liley	F. Matthews	Furness, Withy & Co., Ltd.
John Biscoe	VPNE	27.7.50	W. Johnston			Government of the Falkland Islands.
John Holt	GNFD	31.10.50	J. Shaw	J. G. Jones, W. L. Harrison, R. J. Griffiths	E. G. Hutchinson	John Holt Line, Ltd.
Kaikoura	GZPZ		N. Fraser	G. S. Gunn		Trinder, Anderson & Co.
Kaipaki	GQGJ	24.4.50	T. M. Fenwick	J. Farnell, J. B. Ricketts, F. Le Messurier	A. Leeder	Trinder, Anderson & Co.
Kaipara	GZPY	6.1.51	J. T. Windus	J. B. McGowan, N. Stirzaker, E. Miller	R. M. Evans	Trinder, Anderson & Co.
Kaituna	GQGG	7.12.50	R. F. Hellings	T. G. Wilson, J. Jackson, G. B. Charleson	A. Clegg	Trinder, Anderson & Co.
Kenilworth Castle	MQLP	1.1.51	L. H. Farrow	R. Dugdale, J. C. Edwards, P. A. Sharp	G. G. Kneath	Union-Castle Mail S.S. Co., Ltd.
Kent	GPDC	18.7.50	J. Moncrieff	S. Lambrick, J. Collins, D. Moran, J. North	R. Heath	Federal Steam Navigation Co., Ltd.
Kenuta	GCBW		J. D. Richards	J. Butterworth		Pacific Steam Navigation Co.
King Robert	MAON	12.8.50	G. Craze	W. Keith, G. Griffiths, P. Kidd	W. Fielding	King Line, Ltd.
King William	GNVF	14.11.50	A. B. Drever	J. C. Davies, T. Fairclough, D. Evans	A. McInnes	King Line, Ltd.
Kingston Onyx	MLFP		A. R. Cornish			Kingston Steam Trawling Co., Ltd.
Kohistan	GSFZ	17.1.51	A. N. Henderson	G. H. Byrne, C. O. Jones, A. Woodward	D. Chapman	F. C. Strick & Co., Ltd.
Laguna	GJKC	20.9.49	R. D. S. Eckford	R. H. Scaiff, W. Johnston, W. McIntyre	K. W. Baddeley	Pacific Steam Navigation Co.
Lambrook	MAOS	4.4.50	H. F. McInnes	J. Orr, R. G. C. Gibson	J. J. Brennan	Galbraith Pembroke & Co., Ltd.
Lanarkshire	GCTC	18.8.50	A. R. Cossar	L. Pogson, A. A. Elston, D. MacMillan	G. J. Ingram	Turnbull Martin & Co., Ltd.
Lancashire	GLZC	15.5.50	E. W. Jeffries	—. Lowe, H. Treasurer, —. Thomas, A. Jones	A. Jones	Bibby Bros. & Co.
Lassell	GFND	1.6.49	J. King	S. Dickenson, K. Horne, P. V. des Landes	N. Moore	Lamport & Holt Line, Ltd.
Latia	GLCF	12.10.49	A. E. Bleasdale	C. S. Owston, E. R. Jenkins, —. Dyson-Cope	J. Brownlee	Anglo-Saxon Petroleum Co., Ltd.
Levernbank	GLPZ	8.7.50	D. Gillies	G. Cheyne, R. Lidstone, D. Moore	A. P. J. Brooke	Andrew Weir & Co., Ltd.
Linguist	GQBC	4.8.50	W. Weatherall	C. S. S. Boam, K. E. Pritchard, J. H. Tranfield	R. Moss	T. & J. Harrison
Livorno	GPWF	14.11.50	G. Goodman	F. Metham, J. A. Pettinger, J. W. Peck	K. W. Baddeley	Ellerman & Wilson Line, Ltd.
Llangibby Castle	GPLV	16.11.49	D. D. Mackenzie	D. Leitch	J. Eager	Union-Castle Mail S.S. Co., Ltd.
Lloydcrest	MAOY	12.10.50	H. R. Knight	H. W. Campbell, R. Thompson	W. Fitzpatrick	Crest Shipping Co., Ltd.
Lobos	GDXL	28.11.50	P. Ray	G. Turner, J. Galston, K. Eastwood	E. Rogers	Pacific Steam Navigation Co.
Loch Avon	GMZT	31.10.50	C. E. Mason	R. Phillips, G. Stapleton, J. Collins	M. R. Littlejohn	Royal Mail Lines, Ltd.
Loch Garth	GMZY	17.11.49	J. Smith, R.D., Cdr. R.N.R.	K. Cutler, M. J. Dean, P. Campbell, T. Challis	D. J. W. Morgan	Royal Mail Lines, Ltd.

Loch Ryan	MAOZ	22.11.49	R. N. Fletcher	T. Evans, R. C. Hunnisett, H. Nixon, C. Cowley	J. F. G. Thomas	Royal Mail Lines, Ltd.
London Craftsman	GMKJ	31.10.50	S. Sloan	R. E. Huggins, D. C. Goodwin, J. Short, K. Foreman	R. Longton	Counties Ship Management Co., Ltd.
Lord Gladstone	MAPA	4.3.49	P. S. Kenning	A. H. Treikelder, J. Janczak, J. S. Armstrong	J. Saidler	Ships Finance & Management Co., Ltd.
Loriga	GCLM	4.3.50	S. E. Ayland	A. S. Maclean, R. Dootson, W. R. Goldie	J. Murray	Pacific Steam Navigation Co.
Losada	GDXM	29.7.49	D. W. Hutchinson	F. J. Leicester, W. Jenkins, A. H. Smith	E. O'Neill	Pacific Steam Navigation Co.
Luminous	MAPB	20.6.49	S. Weatherston	A. W. Banks, R. M. Chalmers	D. Whiteling	H. E. Moss & Co.
Macharda	GKKF	19.6.50	R. A. Penston	—. Jackson, —. Crestwood	J. Caddy	T. & J. Brocklebank, Ltd.
Magdapur	GBJX	6.2.50	A. Hill, O.B.E.	J. Watson Ross, P. A. Gunson, A. Wood, —. Pearson	F. Bailey	T. & J. Brocklebank, Ltd.
Mahanada	GOFM	4.1.49	J. W. B. Robertson, R.D., R.N.R.	J. Brand, D. S. Carter, —. Briscoe, —. Floyd	T. Williams	T. & J. Brocklebank, Ltd
Mahia	GNZV	21.11.50	—. Hayward	R. F. Hamilton, A. R. Stephenson, R. Munro, J. Magill	R. Haskayne	Shaw Savill & Albion Co., Ltd.
Mahout	GDZN	22.5.50	H. F. Scions	D. L. Campbell, E. G. Anderson, H. L. Burn	C. W. Jacobs	T. & J. Brocklebank, Ltd.
Mahseer	GZSV	5.6.50	L. T. Owen, O.B.E.	D. Carter, F. D. Mitchell, A. Halcrow	R. Burton	T. & J. Brocklebank, Ltd.
Mahsud	GSCP	6.9.49	L. E. Jeans	D. L. des Landes	B. Pinn	T. & J. Brocklebank, Ltd.
Maihar	GSCL	13.4.50	W. Gibson	O. Pritchard, F. Mitchell, P. A. Gunson	F. C. Bailey	T. & J. Brocklebank, Ltd.
Makalla	GOFN	14.6.50	T. C. Eddy	D. H. Morris, J. H. Bennett, T. Hamilton	G. Caddy	T. & J. Brocklebank, Ltd.
Malancha	GZRD	9.9.49	S. Broughton	J. Clarke, J. R. Kemp, D. J. Evans	B. J. Smith, M.B.E.	T. & J. Brocklebank, Ltd.
Malmesbury	MAQE	31.10.50	R. Ross	W. P. Russell, J. Hands, F. Ferguson	R. Greenhaugh	Houlder Bros. & Co., Ltd.
Maloja	GFBD	8.9.50	E. J. Parry	R. M. Sinclair, —. Eagle, W. C. Rimmer	W. Dawson	P. & O. Steam Navigation Co.
Manchester City	GBBP	6.4.50	H. Hancock	W. E. Quirk, R. Wadsworth, R. O. White	A. S. J. Broadbent	Manchester Liners, Ltd.
Manchester Commerce	GKMY	29.8.50	M. E. Bewley	D. C. Woodall	F. M. Berry	Manchester Liners, Ltd.
Manchester Division	GBYR	2.6.50	W. Hine, R.D., Cdr. R.N.R.	G. S. Bacon, D. S. Millard, T. Hancock	R. S. Pogson	Manchester Liners, Ltd.
Manchester Merchant	MGZQ		F. D. Struss, O.B.E., D.S.C.			Manchester Liners, Ltd.
Manchester Port	GYNF	10.1.50	F. Downing	J. E. Jones, J. S. Dalgarno, T. W. Field, A. H. Swan	P. B. McNab	Manchester Liners, Ltd.
Manchester Progress	GPGD	12.10.50	E. W. Espley	G. R. Thompson, L. C. Taylor, N. W. Cockshoot	W. H. Critchley	Manchester Liners, Ltd.
Manchester Regiment	GBRD	19.10.49		W. R. McLaren, J. E. Askew, A. Swan	A. Reid	Manchester Liners, Ltd.
Manchester Shipper	MAPC	14.1.47	E. W. Raper	F. Lewis, D. Heaton, T. H. Lynn	E. Ambler	Manchester Liners, Ltd.
Manchester Trader	GMWG	12.1.49	W. H. Downing	W. E. Oliver, P. N. Fielding, —. Sullivan	A. C. Gavin	Manchester Liners, Ltd.
Mandasor	GBNY	8.11.49	R. Humble	C. Grey, G. W. Sinclair, P. Manson	G. W. Hazel	T. & J. Brocklebank, Ltd.
Marengo	GLFW	3.3.50	F. Ellison	H. Edwards, H. Riley, C. Main	G. Camm	Ellerman's Wilson Line, Ltd.
Margay	GFYQ	22.5.50	E. A. Prentice	A. J. Thompson, B. S. Kenn, J. Jones	L. L. Lithgow	Kaye, Son & Co., Ltd.
Markhor	GTFZ	8.12.50	J. B. Newman	I. A. Maclaren, M. H. Taylor, P. L. Woodward, D. A. M. O'Byrne	G. Stone	T. & J. Brocklebank, Ltd.
Marna	MLPK	14.6.50	R. J. Sinclair	I. C. Macdonald, A. Petrie	R. J. Sinclair	Chr. Salvesen & Co.
Marsdale	GBKB	18.10.50	M. Ferguson	—. Webster, T. Scales, J. Bennet	T. Slattery	Kaye, Son & Co., Ltd.
Martand	GTGG	18.10.50	J. Fox-Lloyd	H. Defty, P. N. Bonny, J. Robertson	D. H. Butterworth	T. & J. Brocklebank, Ltd.
Martita	GNQT	21.12.49	H. Bunn	M. G. Stevens, H. R. Watson, D. Johnston	D. Diver	Kaye, Son & Co., Ltd.
Mataroa	GCSV	15.5.50	R. G. James, R.D., Capt. R.N.R.	J. Williams, P. Carden, R. Ryding	L. Boyce	Shaw Savill & Albion Co., Ltd.
Matheran	GOFQ	18.9.50	H. McGregor	H. Simpson, J. A. Miller, R. F. Holland	P. Neeson	T. & J. Brocklebank, Ltd.
Matina	GSZX	21.12.50	H. Roberts, O.B.E.	W. F. Young, E. Whitehouse, R. L. Leech	A. Knight	Elders & Fyffes, Ltd.
Mauretania	GTTM	9.1.51	C. Ivan Thompson	M. B. Cox, O. F. Elsom, J. P. Ward, G. R. Carter	F. Clarke	Cunard Steamship Co., Ltd.
Media	GSWR	20.7.50	D. M. MacLean, D.S.C., R.D., R.N.R.	R. G. Hunt, J. O. Springall, R.D., R.N.R., R. Hardman	J. MacArdle, M.B.E.	Cunard Steamship Co., Ltd.
Melbourne Star	GDFZ	6.2.50	F. N. Riley, D.S.O.	R. G. Taylor, D. S. Gilmour, D. A. R. James	J. Clarke	Blue Star Line, Ltd.

Name of Vessel	Call Sign	Last Return Received	Captain	Observing Officers	Senior Radio Officer	Owners/Managers
Millais	MAPH	14.10.49	A. R. Bibby, O.B.E.	J. Edgar, D. S. Leicester, A. B. Baines, D. Sapp	J. Williams	Lamport & Holt Line, Ltd.
Mirror	GDFL	7.12.50	S. P. Sheldon	P. A. J. Edwards, G. W. Heron, J. W. Willmer	A. Carmichael	Cable & Wireless, Ltd.
Monarch	GBDF	5.12.49	J. P. F. Betson	—. Bates, J. Ruddock, A. Gillesbie, R. A. Evans, —. Chisholm	D. Rendall	H.M. Postmaster-General
Mooltan	GFBC	2.6.50	C. E. Pollit	J. W. Owen, L. H. Kellett, E. M. Phelps	J. Ormiston	P. & O. Steam Navigation Co.
Moveria	GKYW	7.12.50	J. Jack	G. Waddle, A. C. Henderson, W. C. McKeen	H. D. Robinson	Donaldson Bros. & Black, Ltd.
Mulbera	GFTM	12.1.51	A. M. Edmondson	P. Middleton	—. Phillips	British India Steam Nav. Co., Ltd.
Myrtlebank	GLQB	1.3.50	F. Hale	P. A. Logan, A. Cockburn, I. S. Currie	N. Kehoe	Andrew Weir & Co., Ltd.
Napier Star	MAPN	24.7.50	M. Tallack			Blue Star Line, Ltd.
Naticina	GIGH	29.11.50	F. Mansfield	J. D. Dyson, A. Douglass, B. Bagler, J. Thompson, A. Batey	J. W. Starrs	Anglo-Saxon Petroleum Co., Ltd.
Neaera	MQTG		R. G. Green	V. Graham		Anglo-Saxon Petroleum Co., Ltd.
New Australia	GZKD	24.1.51	D. Aitchison	W. Newport, C. Tucker, —. Hayward, —. Bird, P. K. Murchison	—. Chick	Shaw, Savill & Albion Co., Ltd.
New Zealand Star	GYCR	26.11.49	G. Owen, O.B.E., R.D., Cdr. R.N.R.	R. Stewart, J. G. Reeve, P. Brecknell	C. J. Carter	Blue Star Line, Ltd.
Newfoundland	GNMC	17.1.51	C. H. Kenyon	J. B. Stewart, J. T. Sheffield, E. W. Foxworthy	T. Cahill	Furness Withy & Co., Ltd.
Nordic	GDJC	9.1.51	E. G. Jones	P. R. Edwards, K. L. Row, R. N. P. Johnston	T. D. Bailey	Prince Line, Ltd.
Norfolk	GJLV	14.11.50	B. Evans	—. Heron, A. P. Harrington, J. R. Witchell	F. Wilman	Federal Steam Nav. Co., Ltd.
Norvegian	GDMC	24.1.51	A. L. Hunter	D. K. Dickson, J. Hunter, G. M. Clark	H. T. Hamer	Donaldson Bros. & Black, Ltd.
Nottingham	GCNC	28.11.50	H. D. Horwood, R.D., Cdr. R.N.R.	E. T. Worster, B. Linklater, I. Cubitt	J. Heath	Federal Steam Nav. Co., Ltd.
Nova Scotia	GNNK	22.5.50	J. L. Anson, O.B.E.	J. D. P. Williamson, R. Heys, J. Williams	W. C. Brock	Furness Withy & Co., Ltd.
Novelist	GMLG	10.1.50	T. E. Steele	L. J. Sharman, G. B. Roberts, J. W. Embleton	J. Sheeny	T. & J. Harrison
Orari	GJKX	21.11.50	F. Lougheed	J. Crewdson, A. A. Faulkner, W. Dawes	C. Robinson	New Zealand Shipping Co., Ltd.
Orcades	MABA	22.9.50	I. E. G. Goldsworthy, R.D., R.N.R.	O. F. W. Pitts, L. A. Finch, G. D. Fletcher	N. A. Boon	Orient Steam Navigation Co., Ltd.
Orion	GYKL	15.5.50	N. A. Whinfield	M. R. Wilmshurst, P. Leighton, D. P. Blois	T. H. Shannon	Orient Steam Navigation Co., Ltd.
Ormonde	GLYC	19.6.50	C. K. Blake, O.B.E.	J. K. Thornton, E. V. Harris, J. S. Gregson	R. Oakley	Orient Steam Navigation Co., Ltd.
Orontes	GBXM	3.8.50	S. S. Bernand, O.B.E.	R. F. Underwood, F. W. Woolley, D. Hays	F. Murphy	Orient Steam Navigation Co., Ltd.
Otranto	GFKV	16.1.50	R. J. Galpin, R.D., Cdr. R.N.R.	E. Riddlesdell, R.D., Lt.-Cdr. R.N.R., C. S. Thomas, J. W. Terry, G. McGowan, J. A. Benseley	C. J. Seaton	Orient Steam Navigation Co., Ltd.
Pacific Exporter	GBJC	14.6.50	G. Brown	R. E. G. Simmons, R. G. G. Bonney, D. C. Aitchison	A. Cory	Furness Withy & Co., Ltd.
Pacific Fortune	GBFM	26.8.50	E. O. Evans	J. Whitby, —. Sturt, —. Willoughby	—. Thomas	Furness Withy & Co., Ltd.
Pacific Importer	GDKV	18.8.50	B. M. Collard	G. Cook, A. H. Linden, E. H. Gregson	W. Britton	Furness Withy & Co., Ltd.
Pacific Liberty	GDFQ	27.7.50	W. F. Swann	R. Coyle, N. Land, C. G. Stiff	R. Faulkner	Furness Withy & Co., Ltd.
Pacific Nomad	GCRZ	1.8.50	W. Hutchinson	J. Tye, J. T. Cameron, P. Cable	A. Adamson	Furness Withy & Co., Ltd.

Pacific Stronghold ..	GNSQ	8.7.50	F. H. Perry	I. H. Clark, D. R. Gibson, R. W. Keene, R. Hughes	S. A. Vincent ..	Furness Withy & Co., Ltd
Pacific Unity ..	GUAN	14.11.50	E. A. Kemp	H. M. Head, A. A. Drake, J. Purrier ..	A. E. Trim	Furness Withy & Co., Ltd.
Palacio	GNJW	22.3.50	J. P. Harris	L. P. Sheppard, D. Fraser, R. M. Dunn	T. A. Robinson ..	MacAndrews & Co., Ltd.
Palana	MMBF	6.3.50	F. R. Spurr	—. Savage, —. Trower, G. E. Harris ..	H. Olding	P. & O. Steam Navigation Co
Palomares	GJGN	15.11.50	D. J. Thomas, M.B.E. ..	D. A. Dickenson, W. H. Munday, A. Mannings	M. F. Conroy ..	MacAndrews & Co., Ltd.
Pampas	GCDL	22.3.50	R. C. S. Woolley, R.D., R.N.R.	H. Riley, J. A. Martin, B. Sugden ..	J. Tuck	Royal Mail Lines, Ltd.
Papanui	GDJW	18.8.50	H. N. Lawson, R.D., R.N.R.	B. E. Crust, M. R. Forcer, J. D. Ekins ..	D. Roberts	New Zealand Shipping Co., Ltd
Paparoa	GBCZ	20.9.50	N. Thomas	J. D. Cubitt, F. I. Christall, D. A. Williams	A. B. Mowatt ..	New Zealand Shipping Co., Ltd.
Paraguay	MAQS	31.1.50	H. V. Todd, R.D., Cdr. R.N.R.	A. R. Evans, R. H. Greenall, V. A. Sutton	P. Goulden	Royal Mail Lines, Ltd.
Pardo	GMNZ	1.9.50	T. Stephens	M. B. Wingate, G. Dudley, J. G. Lenfesty	P. Wadhams ..	Royal Mail Lines, Ltd.
Parima	GCLQ	21.3.49	H. E. Sang	J. T. Jones, J. C. Derby, J. M. Barber ..	N. H. Crocker ..	Royal Mail Lines, Ltd.
Paringa	MMBD	12.8.50	H. P. Mallett	M. Waghorn, A. R. Howard, —. Shipp	B. S. Magennis ..	P. & O. Steam Navigation Co.
Parthia	GSWQ	4.8.50	J. W. Caunce, R.D., R.N.R.	A. P. Graham, T. Jones, T. H. Davies ..	A. O'Sullivan ..	Cunard Steamship Co., Ltd.
Perim	GCGB	21.12.50	W. Paice	F. F. Irons, N. G. Jenner, C. W. Lyon, P. W. Bull	F. Groves	P. & O. Steam Navigation Co., Ltd
Perthshire	GYWK	28.11.50	A. J. Hogg	A. H. Black, M. P. R. Turner, G. W. Sharp	F. Raynor	Turnbull Martin & Co., Ltd.
Philomel	GYPV	18.10.50	H. M. Selmar	D. C. Diggins, —. Agnew, W. A. Devine	T. Milnes	General Steam Navigation Co., Ltd.
Philosopher	MAQV	13.10.50	T. Winstanley	R. Hill, M. Watson, R. A. Patmore ..	W. C. Doyle ..	T. & J. Harrison
Pilcomayo	GBZX	15.5.50	F. A. C. Thacker	W. Kennedy, E. J. O'Keefe	E. Jones	Royal Mail Lines, Ltd.
Pipiriki	GDRQ	21.12.50	H. R. M. Smith	I. C. Davidson, G. W. Wotton, J. Marshall	L. Carter	New Zealand Shipping Co., Ltd.
Polar Maid	MAQX	14.6.50	J. T. Leask	E. D. Smith, T. Gilmour, R. Marshall ..	W. Tulloch	Chr. Salvesen & Co.
Port Auckland ..	GWRB	31.10.50	J. G. Lewis, O.B.E. ..	F. R. Gorman, R. A. Holmes, V. A. Hunt, K. Jayne	J. S. Skinner ..	Port Line, Ltd.
Port Brisbane ..	GWRC	8.8.50	H. Steele, O.B.E.	G. K. Morris, P. Smith, R. J. King ..	J. Griffiths	Port Line, Ltd.
Port Chalmers ..	GWQR	14.6.50	P. H. Pedrick	R. C. Webb, G. G. Gilling, E. R. Jenkins, C. Milne	E. G. Gunner ..	Port Line, Ltd.
Port Hobart	GKGC	9.5.50	L. Copeland	A. T. Braund, E. Newstead, L. Garnham	B. Morley-Evans ..	Port Line, Ltd.
Port Jackson ..	GZKR	1.1.51	P. S. Ball	H. Robson, D. J. Batterbee	R. C. Crompton ..	Port Line, Ltd.
Port Lincoln	GFZK	10.1.51	G. G. Langford	H. J. Thompson, V. G. K. Webster, R. Shircore	P. J. McKeon ..	Port Line, Ltd.
Port Macquarie ..	MAQY	29.8.50	H. B. C. Clinch	T. A. Smith, J. E. Lascelles, G. A. J. Balfour	R. Robertson ..	Port Line, Ltd.
Port Napier	GPKD		G. W. Hazlewood	S. D. A. Pritchard		Port Line, Ltd.
Port Philip	MAQZ	12.1.51	J. G. Lewis, O.B.E. ..	T. G. Ward, —. Kensett, T. A. Fairbairn	B. McGovern ..	Port Line, Ltd.
Port Pirie	GLVQ	12.10.50	F. W. Bailey, M.B.E. ..	J. T. Owen, P. G. Henneker, W. A. Wakefield	W. Miller	Port Line, Ltd.
Port Vindex	MAUW		H. H. Smith, O.B.E. ..	D. N. Robinson, G. Ballinger, J. R. King		Port Line, Ltd.
Port Wellington ..	GDNJ	31.10.50	E. J. Syvret	C. A. Rhode, I. H. Stewart, G. G. Mooney	J. B. French ..	Port Line, Ltd.
Port Wyndham ..	GYCW	14.11.50	E. E. Roswell	E. R. Cliffe, M. E. Field, W. M. G. Lloyd	J. N. Coutts ..	Port Line, Ltd.
Potaro	GNLJ	16.11.49	G. H. Taggart	J. A. Cresswell, R. R. Thompson, J. T. Price	T. J. Berry	Royal Mail Lines, Ltd.
Powell	GKJL		D. Cornwell			United Whalers, Ltd.
Pretoria Castle ..	GOAE	14.11.50	R. Wren, D.S.O.	J. Kerr, M. B. Watts, K. J. Trayner, A. F. George	H. Oliver, M.B.E. ..	Union-Castle Mail S.S. Co., Ltd.
Radley	GZZG	2.5.50	C. J. Forster	H. G. Strickland, D. A. Barfoot, J. D. Todd	P. Probert	Stephens, Sutton Ltd.,
Rakaia	GFGW	28.11.50	A. I. Robertson, A.D.C., R.D., R.N.R.	D. E. Moran, T. S. Wadie, M. D. Ward	R.Wilson	New Zealand Shipping Co., Ltd.
Ramore Head ..	MAXX	18.8.50	W. Haddock, O.B.E. ..	N. C. Stark, R. Crawford, C. E. Pringle	B. P. Lewis	G. Heyn & Sons, Ltd.

Name of Vessel	Call Sign	Last Return Received	Captain	Observing Officers	Senior Radio Officer	Owners/Managers
Ranchi	GIKW	24.1.51	A. G. Jenkins	—. Woodroe, R. Lowther, P. Saunders, E. C. Jones, D. J. Masson	R. V. Gregory	P. & O. Steam Navigation Co.
Rangitane	GDBV		T. L. Maltby	F. S. Angus	C. Lambe	New Zealand Shipping Co., Ltd.
Rangitata	GSZN	15.11.50	G. Kinnell, O.B.E.	G. Munson, G. Risley, G. Pool	J. Grant	New Zealand Shipping Co., Ltd.
Rangitiki	GSXW	11.9.50	A. E. Lettington, O.B.E., D.F.C.	J. Guyler, A. Battley, G. W. Dunsford, P. Moolton, D. Sywel	J. Poyner	New Zealand Shipping Co., Ltd.
Rangitoto	GLMV	27.1.51		G. Bevis, E. B. Mallett, J. Mason, S. Oates	E. R. Saunders	New Zealand Shipping Co., Ltd.
Regent Hawk	GMND	20.9.50	J. Ward	T. Moncrieff, A. R. Cardno, Z. Wojewodzki	R. W. Jones	Regent Petroleum Tankship Co., Ltd.
Reina Del Pacifico	GMPS	29.6.50	J. Whitehouse	J. A. Greenwood, J. Peters, H. Walmesley, J. Bruce	J. Butler	Pacific Steam Navigation Co.
Repton	GPFL	27.3.50	D. Cownie	D. M. Muir, W. Jones, O. N. Selwood	A. Lloyd	Galbraith, Pembroke & Co., Ltd.
Rhodesia Star	GUAX	21.11.50	G. L. Evans, O.B.E.	E. W. Jenkins, R. Bayley, R. B. Escreet	C. I. Roe	Blue Star Line, Ltd.
Rialto	GBLV	21.4.50	E. Tyler	J. Etches, H. Riley, K. H. Thompson	J. Sanderson	Ellerman's Wilson Line, Ltd.
Richmond Castle	GCSP	8.7.50	A. C. M. Black, O.B.E.	—. Freer, —. Oswald, G. D. Attwood	T. W. Shea	Union-Castle Mail S.S. Co., Ltd.
Rippingham Grange	GIGP	1.7.50	R. Owen, O.B.E.	H. Butler, A. J. Bulley, J. Taylor, A. H. Fawcett	R. G. J. Alton	Houlder Bros. & Co., Ltd.
Rochester Castle	GZQF	25.4.49	T. H. Whatley	G. D. Fowler, R.D., Lt.-Cdr. R.N.R., J. V. H. Drummond, D. Campbell	G. Mein	Union-Castle Mail S.S. Co., Ltd.
Roslin Castle	GYJZ	25.7.50	F. R. Pope	R. J. Miller, D. Lawton	J. Tuck	Union-Castle Mail S.S. Co., Ltd.
Rowallan Castle	GDFT	12.9.50	A. E. F. Payne	T. Allan, R. H. Hudson, E. J. C. Bennett	R. Emmett	Union-Castle Mail S.S. Co., Ltd.
Roxburgh Castle	GBGS	25.1.50	J. D. B. Fisher	P. Eckford, M. Kenshole	L. W. Bettinson	Union-Castle Mail S.S. Co., Ltd.
Royal Star	MARJ	18.7.50	G. Aldridge	W. Borthwick, B. Edgington, S. Buchanan	R. Read	Blue Star Line, Ltd.
Ruysdael	MAQP	31.10.50	J. Burns	R. J. Scott, G. Leith	R. J. C. Holmes	Bolton S.S. Co., Ltd.
Sacramento	GKCN	20.2.50	J. E. Robinson, M.B.E.	F. Johnson, W. Walker, J. A. Ryley	J. P. Carter	Ellerman's Wilson Line, Ltd.
St. Crispin	MBSW	10.12.47	A. E. Hall	D. L. Verity	D. L. Verity	B. A. Parkes
St. Zeno	MQMJ		L. Abbey			T. Hamling & Co., Ltd.
Salacia	GZRN	14.11.50	T. S. Graham	J. L. Downie, D. Nicholson, E. H. Knox	W. Docherty	Donaldson Bros & Black, Ltd.
Salamanca	GLSG	7.12.50	D. W. Hutchinson	R. B. Bryant, C. A. Roy, K. Williams	A. Hill	Pacific Steam Navigation Co.
Salaverry	GBLQ	11.1.50	G. B. Wardale	P. D. O'Driscoll, P. B. Webster, J. J. Butterworth	J. Slater	Pacific Steam Navigation Co.
Salinas	GLIK	22.5.50	H. Heardley	A. Powell, J. Weatherstone, W. R. Holmes	J. Cummins	Pacific Steam Navigation Co.
Samanco	MARQ	20.4.49	A. Lyall	D. I. Jones, W. B. Holmes, D. J. Houghton	A. Hatfield	Pacific Steam Navigation Co.
San Adolfo	GYKK	21.11.50	L. Mays	A. Walker, A. T. Cross, D. Frazer	H. Hughes	Eagle Oil & Shipping Co., Ltd.
San Cirilo	GZMR	21.12.50	T. L. Pearson	E. N. Givens, B. J. Hamilton, D. N. Richards	W. W. Ellison	Eagle Oil & Shipping Co., Ltd.
San Felix	GFJZ	21.11.50	G. Harris	W. Gibb, B. T. Orange, R. James	W. L. Radcliffe	Eagle Oil & Shipping Co., Ltd.
San Velino	GCNY	14.11.50	J. B. Macarthy	M. H. Jones, G. G. B. Putt, H. Bailey	J. P. Brosnan	Eagle Oil & Shipping Co., Ltd.
San Veronico	MASQ	22.5.50	W. Lamb	W. W. Gibb, J. Hunter, R. Atkinson	R. G. Morris	Eagle Oil & Shipping Co., Ltd.
San Vulfrano	MASR	3.10.50	F. R. H. Atkinson	T. D. Wright, D. P. Carroll, R. K. Wighley	E. Ingham	Eagle Oil & Shipping Co., Ltd.
Sansu	GQQN		O. Owens, O.B.E.			Elder Dempster Lines, Ltd.
Santander	GBNR	28.11.49	E. C. Hicks	K. Thomas, O. A. Baker, J. T. Bruce	C. Murray	Pacific Steam Navigation Co.
Sarmiento	MARW	17.1.51	G. H. Rice	F. Nuttall, A. M. Jestico, W. A. E. Johnston	N. Roberts	Pacific Steam Navigation Co.
Saxon Star	MARX	24.7.50	J. D. W. Davies	H. Tompsett, D. Gaffney, G. Irving	A. Reece	Blue Star Line, Ltd.
Scholar	GDCC	8.8.50	D. Wolstenholme	D. Hancock, R. E. Harvey, R. Williams	A. Hudson	T. & J. Harrison
Scottish Prince	GDSK	3.10.50	J. L. Edwards	R. W. B. Brown, N. Gale, G. Ballard	P. M. Evans	Furness Withy & Co., Ltd.
Scythia	GDYP		W. M. Stewart, O.B.E.	G. D. Williams, W. L. McDougall		Cunard Steamship Co., Ltd.
Selector	MARZ	3.3.49	W. H. Slaughter	W. McInnes, W. Owens, O. T. Jones, R. M. Harrison	J. Clerk	T. & J. Harrison

Settler	GTTX	28.2.50	R. F. Phillips	J. Bean, P. Dilleigh, S. Gamble	W. Macmahon	T. & J. Harrison
Shielbank	GDPZ		C. S. Holbrook			Andrew Weir & Co., Ltd.
Silverbriar	GDWM	15.5.50	W. N. Tulloch	J. H. Tomlinson, D. Lamont, A. N. Cockroft	J. A. Wickens	Silver Line, Ltd.
Silverguava	GMVK	12.10.50	J. Duncan, O.B.E.	F. Hewitt, J. S. Bowman, G. A. Hubbard	J. P. Deagan	Silver Line, Ltd.
Silveroak	GCQR	29.8.50	E. Palmer	J. McK. Batchen, J. M. Donaldson, E. A. Hansen	H. Melling	Silver Line, Ltd.
Silverplane	MABL	31.10.50	E. Stark	H. R. H. Rose, G. K. Harrison, C. C. Walker	A. Arthurs	Silver Line, Ltd.
Silversandal	GSFQ	12.1.51	G. F. Chivers	G.F. Lightfoot, A. M. Kirkby, D. Goddard	P. Killeen	Silver Line, Ltd.
Silverteak	GSFR	30.12.49	E. L. Tilmouth	S. W. Rothwell, H. Rose, M. Bingham	J. Thomas	Silver Line, Ltd.
Silverwalnut	GSFT	12.1.51		J. M. Evans, J. B. de Wet, O. R. Purvis	J. Hands	Silver Line, Ltd.
Sneaton	GDBS	28.11.50	W. Armstrong	E. Wilson, J. Marshall, F. T. Lamb	T. Goodrum	Headlam & Son
Socotra	MASC	14.6.50	J. C. W. Last, O.B.E., Cdr. R.N.R.	J. L. Dunkley, G. P. Blyth, T. M. Lincoln, P. B. Jackson	H. F. Kemp	P. & O. Steam Navigation Co.
Somerset	GJMN	12.1.51	P. S. Calcutt	C. S. Masson, R. E. Baker, C. A. Miller, C. S. Keay	P. Broome	Federal Steam Navigation Co., Ltd.
Southern Atlantic	GBLY	30.8.50	M. G. Oliver	L. M. Smith, A. Anderson, D. Lawson	P. Curson	Chr. Salvesen & Co.
Southern Collins	MASE	20.4.50	L. Robertson	I. Sinclair, D. Moar, G. Reid	J. MacKinnon	Chr. Salvesen & Co.
Southern Garden	MASF	1.5.50	W. J. Swanson	W. Scott, N. McLean, K. T. Austin	G. R. Campbell	Chr. Salvesen & Co.
Southern Harvester	GFZJ	20.4.50	K. Granöe	J. E. M. Balfour, F. Johansen	A. Turnbull	Chr. Salvesen & Co.
Southern Opal	MASG	22.8.50	A. F. Baikie	W. Spence, J. L. Logie, R. Kinder, J. Flucker	C. Houston	Chr. Salvesen & Co.
Southern Venturer	GNNM	1.5.50	H. Myhre	A. W. Aitken, R. P. Tweedie	J. Hawick	Chr. Salvesen & Co.
Sovac	GDDV	30.1.51	A. McCausland	W. Lyall, H. G. Moon, D. Gleadow	K. C. Morris	Vacuum Oil Co., Ltd.
Speaker	GCGT	13.1.51	E. V. Dunn	W. E. Kind, J. M. Doran, T. Pennant	J. Clarke	T. & J. Harrison
Specialist	GCYF	10.11.48	L. F. Harriman	J. Beam, A. F. Perry	J. Glover	T. & J. Harrison
Springfjord	GQKQ	18.1.49	T. R. Mackle	J. Reid	A. Guy	Springwell Shipping Co., Ltd.
Stancourt	GKCP	21.12.50	S. G. G. Williams	J. R. Jones, G. G. Smeaton, J. C. Nichol, C. Bennett	M. K. Kavanagh	J. A. Billmeir & Co., Ltd.
Stanhall	GCQZ	14.11.50	L. M. Davies	M. O'Neil, T. Mitchell, J. Caldwell	L. Boughton	J. A. Billmeir & Co., Ltd.
Stirling Castle	GYPX	5.9.50	W. A. Pace, O.B.E.	K. T. McNish, R. Kirton, D. A. Garman	P. P. Williams	Union Castle Mail S.S. Co., Ltd.
Stirlingshire	GCQD	13.9.50	E. W. Jenkins	T. R. Halliday, J. Caley, G. M. Silvers	M. J. Braddon	Turnbull Martin & Co., Ltd.
Strathaird	GRSX	12.1.51	H. S. Allan, R.D., Cmde. R.N.R.	—. West, —. Knowles, K. Walker, G. Makin, D. J. Knight, A. W. Pickering	J. F. Clark	P. & O. Steam Navigation Co.
Stratheden	GDGT	8.9.50	S. W. S. Dickson	M. O'Connell, D. C. Guthrie	H. S. Horn	P. & O. Steam Navigation Co.
Strathmore	GYMS		E. Lee	J. B. Wilson, B. Thomson, C. I. H. Greaves		P. & O. Steam Navigation Co.
Strathnaver	GRPZ	19.1.51	J. C. Mellonie	D. T. Bolas, J. D. O. Green, I. O. Drysdale, J. M. Donkin, P. B. Jackson	H. Delve	P. & O. Steam Navigation Co.
Struan	MASJ	2.6.50	M. Polson	S. Sutherland, —. Ross, G. MacDonald	W. Hayes	Chr. Salvesen & Co.
Suffolk	GQQS	3.10.50	F. Pover	B. E. Applegate, P. J. Field, M. J. Byrd	H. Hare	Federal Steam Navigation Co., Ltd.
Suncrest	GNWW	13.10.50	A. Miller	N. Munce, P. A. Kelly, J. B. Dale	G. Dennison	Crest Shipping Co., Ltd.
Sutherland	GBYG	14.11.50	R. W. Nicolson	E. F. Smith, G. Galloway, R. B. Campbell	I. R. Lloyd	B. J. Sutherland & Co., Ltd.
Swainby	GPFS	22.5.50	J. E. Roddam	K. Jackson, A. C. Bolton, W. Fallon	D. Ford	Sir R. Ropner & Co., Ltd.
Sydney Star	MKSM	8.7.50	T. F. Macdonald, O.B.E.	R. H. R. Jones, F. A. Ball, I. C. Mackintosh	J. McConnell	Blue Star Line, Ltd.
Talca	GCDT	22.5.50	T. G. McGill	R. Riley, A. Gibson, M. Backhouse	S. Johns	Pacific Steam Nav. Co.
Tamaroa	GFWX	17.1.51	G. P. McCraith	J. G. Beck, D. G. Ede, H. F. Singleton	D. MacRae	Shaw Savill & Albion Co., Ltd.
Tamele	GCBF	18.10.50	W. Munt	H. Butler, C. B. Powell, —. Boyle, —. Tunnicliffe	F. Broomfield	Elder Dempster Lines, Ltd.
Tarkwa	MASU	4.10.50	G. D. Simpson	W. Lowthian, G. Cooke, R. Martin	G. I. Gilling	Elder Dempster Lines, Ltd.
Tasso	GLMR	14.11.50	F. Mason	A. T. Jardine, J. E. Wray, G. Mitchell	D. Withers	Ellerman's Wilson Line, Ltd.
Tectus	GBMJ	14.11.50	K. J. Morris	E. Prudhoe, A. C. Watson, T. H. Potts	P. R. Cottrill	Anglo-Saxon Petroleum Co., Ltd.
Tekoa	GJFQ	7.12.50	J. D. Bennett	A. S. Collins, E. J. Newing, P. B. Eccles	T. Herbert	New Zealand Shipping Co., Ltd.

Name of Vessel	Call Sign	Last Return Received	Captain	Observing Officers	Senior Radio Officer	Owners/Managers
Telemachus	GBLB	11.2.49	J. F. Webster	A. G. Reed, P. D. F. Cruickshank, E. Brown	J. Campbell-Wilson	A. Holt & Co.
Teviot	MASX	29.6.50	L. T. Peterson	H. W. Riley, J. M. Barber, R. G. Stapleton	F. Fawcett	Royal Mail Lines, Ltd.
Thamesfield	GDGK	27.1.51	M. H. Hooker	J. Blakie, I. A. M. Haddow, J. Horsborough	S. O'Driscoll	Hunting & Son, Ltd.
Theliconus	GBMT	24.1.51	T. W. A. Webster	R. A. Moorhouse, P. S. L. Nobes, P. J. E. Marshall	P. J. Cottrill	Anglo-Saxon Patroleum Co., Ltd.
Timaru Star	GKKM		C. Watson	H. R. Tompsett		Blue Star Line, Ltd.
Tinto	GBYT	20.5.49	S. H. Bennett, M.B.E.	A. Ledger, E. J. Agar	G. Nicholls	Ellerman's Wilson Line, Ltd.
Tongariro	GLFZ	14.6.50	C. P. Robinson	M. M. Shaw, R. Loveridge, J. B. Camping	J. A. Hasson	New Zealand Shipping Co., Ltd.
Torr Head	GZPW	13.10.50	M. Kennedy	E. G. Davy, J. McCormick, E. McCudden	G. Penketh	G. Heyn & Sons, Ltd.
Tregenna	GBPM		C. Lloyd Collings, O.B.E.			Hain S.S. Co., Ltd.
Trelevan	GBPQ		S. K. Hawken			Hain S.S. Co., Ltd.
Trelyon	GBPP		F. J. Cornish	D. A. Loud, A. V. Rowles, H. Gravell	T. H. Murrin	Hain S.S. Co., Ltd.
Tresillian	GCKP	28.12.50	J. C. Bate, O.B.E.	J. Williams, B. Martin, V. Wise	J. Jenkinson	Hain S.S. Co., Ltd.
Trevaylor	GCKG	22.8.50	A. G. Williams, O.B.E.	T. J. Smith, D. Fife, T. Youdan	—. Tyrer	Hain S.S. Co., Ltd.
Tribesman	GBNZ	28.12.50	J. W. F. Wallis	D. V. Jones, J. Cubbin, H. Bennett	S. Pepper	T. & J. Harrison
Tribulus	GFJS		F. Leask	L. G. Dennis		Anglo-Saxon Petroleum Co., Ltd.
Tronda	MMLX	24.4.50	A. Goodlad	G. Hunter		Chr. Salvesen & Co.
Tweed	GBRP	14.11.50	G. S. Grant, R.D., Cdr. R.N.R.	R. M. Tysoe, —. Baxter, —. Thornhill	M. Healy	Royal Mail Lines, Ltd.
Twickenham	GNDC	22.11.49	J. A. Tully	H. Black, J. Porteous, J. C. Taylor	J. T. Berrie	Watts, Watts & Co., Ltd.
Umtali	GYWB	12.1.51	F. E. J. O'Hea	D. L'Estrange, I. North, J. H. Butcher, F. Bush	S. Hewitt	Bullard King & Co., Ltd.
Umtata	GDQF	13.9.50	F. Harris	J. Thorn, E. Le Vine, R. Paterson, G. T. Gibson	A. H. Coxhead	Bullard, King & Co., Ltd.
Umzinto	GIFQ	3.10.50	R. Harber	E. Bicknell, J. H. Beavan, D. Banks	J. S. Sprunt	Bullard, King & Co., Ltd.
Vancouver City	GIGT	1.1.51	M. D. Louttit	J. H. Thornhill, J. B. Cuckow, E. J. Thompson	R. Butcher	Sir Wm. Reardon Smith & Sons, Ltd.
Vardulia	GCFW	14.10.48	A. N. Sargent, O.B.E., R.D., R.N.R.	J. M. Hughes, —. Hoyle, P. Walton	F. Berry	Cunard Steamship Co., Ltd.
Vestra	MNNB	23.1.50	D. S. Archibald	D. C. White, H. M. Third		J. T. Salvesen & Co.
Volo	GPCJ	31.10.50	G. Mussared	C. Everingham, S. Wilkinson, —. Gooderham	G. Williams	Ellerman's Wilson Line, Ltd.
Waimana	MATW	18.8.50	C. L. Carroll, D.S.C., R.D., R.N.R.	A. C. D. Masters, J. Scott, D. E. Aberdeen	A. Morris	Shaw Savill & Albion Co., Ltd.
Wairangi	MATX	20.9.50	H. B. Smith	C. W. Sendall, B. Hammond, —. Hamilton	W. Freeman	Shaw Savill & Albion Co., Ltd.
Waiwera	GBJB	25.1.50	G. P. McCraith	F. Charnley, J. Gunning, J. B. Cousins	J. Downie	Shaw Savill & Albion Co., Ltd.
Walvis Bay	GKBZ		H. Gentles	J. Marshall		Sir R. Ropner & Co., Ltd.
Wanstead	GFLS	8.12.50	D. G. Martin	I. Jackson, R. G. Charlton, N. Atkinson, D. Stokoe	R. Stewart	Watts, Watts & Co., Ltd.
Warwick Castle	GRRJ	3.10.50	J. Trayner	R. Taylor, P. E. Eckford, N. E. Upham	E. Shaw	Union-Castle Mail S.S. Co., Ltd.
Wendover	GFML		F. Grist	E. Peirce	D. I. J. Townsend	Watts, Watts & Co., Ltd.
Winchester Castle	GTPZ	26.8.50	H. A. Deller	T. Morgan, H. W. Madden, B. Braithewaite	R. Brew	Union-Castle Mail S.S. Co., Ltd.
Woodford	GFMM		W. Shields, O.B.E.	J. Swann, J. Kirby, —. Partridge	W. McKenzie	Watts, Watts & Co., Ltd.
Worcestershire	GFZM		F. C. Brooks	R. B. Williams, A. McLean		Bibby Bros. & Co.
Yoma	GLPN	14.11.49	S. Thompson	J. Thomson, W. E. Harris, T. F. Fields	W. Allen	P. Henderson & Co.
Zealandic	MAGJ	29.6.50	P. F. Owens	P. H. Jowett, I. Sladen, P. G. Jenkins, D. Anderton	A. McLennan	Rio Cape Line, Ltd.

Supplementary Ships

Name of Vessel	Call Sign	Last Return Received	Captain	Observing Officers	Senior Radio Officer	Owners/Managers
Bellerby	MQJF		F. Tate			Ropner Shipping Co., Ltd.
British Duke	GVSW		H. J. McMichael	W. McMorland, J. A. Duck, D. E. Buckley	F. D. Musson	British Tanker Co., Ltd.
Cedarpool	MAHG		J. E. Roddam		N. O'Loughlin	Sir R. Ropner & Co., Ltd.
Eastbank	GFKR		R. Smith	C. G. Watterson, P. Hewitt	W. D. Atkinson	Andrew Weir & Co., Ltd.
Empire Dove	GCMZ		J. Walker			MacAndrews & Co., Ltd.
Empire Trooper	GLXJ		R. H. A. Bond, O.B.E.	P. A. Chubb, T. Kutek, P. Trace	J. Readon	British India Steam Navigation Co., Ltd.
Folda	MLFR		E. Tulloch			Chr. Salvesen & Co.
Frobisher	GTRN		V. A. Buschini	J. A. Wright		R. S. Hewett
Generton	GZJB		W. Wilson			R. Chapman & Son
Greenland	GCLJ	28.11.50	R. Borthwick	W. J. S. Flett	D. W. Crearie	Currie Line, Ltd.
Harmattan	GNYD		A. F. Lidguard			J. & C. Harrison, Ltd.
Maple Hill	MANE					Counties Ship Management Co. Ltd.
Markab	GCVT	20.5.49	R. Chapman	A. Stuart, W. Russell	W. Brown	Phocean Ship Agency, Ltd.
Mulberry Hill	MAKQ		J. Campbell			Counties Ship Management Co., Ltd.
New Prince	GBRN		N. Jinks			R. S. Hewett
Port Alma	GSTN		D. F. Morgan	R. A. Wright, E. Newstead, W. M. G. Lloyd		Port Line, Ltd.
Red Charger	GCNF		H. Daniels			E. D. W. Lawford
Red Crusader	GTBP		R. Nash			E. D. W. Lawford
Red Knight	MBQT		J. Tomlinson	F. O'Brian	R. Green	E. D. W. Lawford
Red Lancer	MKTP		E. Littler			E. D. W. Lawford
Red Rose	MFMX		J. McKernan			E. D. W. Lawford
Robert Hewett	MDYS		G. Elliot	H. Wilcock		R. S. Hewett
**Queen of Bermuda*	GZKF		L. F. Banyard, O.B.E.	N. E. James	H. Stennett	Furness, Withy & Co., Ltd.
Conway, H.M.S.	—	17.1.51	E. Hewitt, R.D., Capt. R.N.R.	The Senior Cadets	—	—
Pangbourne Nautical College	—	14.11.50	H. C. Skinner, O.B.E., Cdr. R.N.	The Senior Cadets	—	—
Worcester, H.M.S.	—	21.12.50	G. C. Steele, V.C., Cdr. R.N. (Retd.)	The Senior Cadets	—	—

* This ship has been recruited by the Bermuda Meteorological Service.

FLEET LIST (Australia)

VOLUNTARY OBSERVING SHIPS

The following is a list of observing ships voluntarily co-operating with the Meteorological Service of Australia

NAME OF VESSEL	CAPTAIN	OBSERVING OFFICERS	SENIOR RADIO OFFICER	OWNERS/AGENTS
Selected Ships:				
Canara	W. Bird, O.B.E.	T. Woodward, J. D. Campbell, C. C. Springall	P. A. Stuart	British India Steam Nav. Co.
Chupra	J. D. Woods	C. Allerton, H. S. Strawbridge, W. L. Hillcoat	R. C. Whiting	British India Steam Nav. Co.
Idomeneus	J. L. Johnston	W. A. Clark, G. D. F. Cruickshank, P. S. Lombard, G. Moncks	A. N. Williams	A. Holt & Co.
Koolinda	J. S. Airey	J. Paulsen, J. Palfreyman, R. Seaward	H. White	Western Australian State Steamships
Koomilya	F. W. Roberts	C. Stewart, R. Sicklin, G. Steinbeck	F. Mackie	McIlwraith, McEacharn, Ltd.
Kooringa	F. McLean	A. D. Hanson, V. Bovell, J. A. Grey		McIlwraith, McEacharn, Ltd.
Lowana	L. Fry	C. A. Blow, T. H. Millidge, J. K. Saint	R. M. Rees	Melbourne Steamship Co., Ltd.
Nellore	T. Mills	A. Johnston, G. Champion, G. Cleveland, K. Skinner	J. Bell	Eastern & Australian S.S. Co., Ltd.
Orestes	F. J. Cockburn	A. Surtees, G. Kitching, R. Denning, P. Beckett	J. Dennison	A. Holt & Co.
River Burnett	L. G. Ramsay	R. Campbell, H. W. Robinson, T. Beckinsale	F. E. Audsley	Australian Shipping Board
River Clarence	W. W. Fish	A. T. Lake, I. K. S. Adam, S. F. Dockwell	G. Harper	Australian Shipping Board
River Mitta	A. Knight	G. Davies, K. Clarence, W. Wiggins	M. Pearson	Australian Shipping Board
Triadic	A. Rhoades	J. P. Milton, W. L. Harboard, W. B. Jeavons	M. Hayter	British Phosphate Commission
Trienza	P. Richardson	D. Neilson, D. Robb, K. Oliver	J. Ward	British Phosphate Commission
Triona	C. L. Evans	P. W. Thompson, S. E. B. Harris, B. J. Robertson	R. G. Neale	British Phosphate Commission
Supplementary Ships:				
Diomed	A. M. Caird	H. A. Jeffrey, K. W. Dunlop, E. Webb	C. Palmer	A. Holt & Co.
Derrigo				Australian Shipping Board
Kybra				Western Australian State Steamship

FLEET LIST (Hong Kong)

VOLUNTARY OBSERVING SHIPS

The following is a list of observing ships voluntarily co-operating with the Royal Observatory, Hong Kong

Name of Ship	Captain	Observing Officers	Senior Radio Officer	Shipping Company or Operators
Anking	E. H. Histead	W. Davidson, J. D. de C. Veale, G. Baxter	G. W. Moore	China Navigation Co., Ltd.
Anshun	J. McKinlay	R. E. S. Jones, J. R. Brett, D. S. Southey	P. L. Littin	China Navigation Co., Ltd.
Bencleuch				Ben Line, Ltd.
Caroline Moller	W. J. Lang	R. H. W. Jackson, N. F. Andrade, Yuan King Lau	P. N. Bhatt	Mollers (Hong Kong), Ltd.
Chang Sha	C. P. Miller	V. R. Woolfe, S. Fergusson, R. Tasker, P. Baxter	R. Gooseman	China Navigation Co., Ltd.
Choy Sang	W. E. Reeve	F. H. Main, E. Jones, A. A. Watson	R. M. Legg	Indo-China Steam Navigation Co., Ltd.
Chun Sang	D. R. G. Kinnear	E. M. Norman, P. D. Coles, T. Y. Yuan	P. J. Beham	Indo-China Steam Navigation Co., Ltd.
Eastern Glory	L. McRae	T. J. Ashcroft, W. E. S. Cream, R. W. E. Little, D. H. Mason	C. D. Evans	Indo-China Steam Navigation Co., Ltd.
Eastern Saga	S. Schofield	C. Thomson, M. J. K. Crighton, J. D. Markland, R. Latchum	R. Stewart	Indo-China Steam Navigation Co., Ltd.
Eastern Queen	D. G. Burleigh	M. I. Groundwater, D. R. McFadzien, I. McInnes, R. J. Cooper	B. Johnson	Indo-China Steam Navigation Co., Ltd.
Eastern Trader	J. L. Baines	A. C. Tai, C. H. Fong, S. H. Ng	F. de Lage	Great Southern Steamship Co., Ltd.
E Sang	G. Owens	J. H. Thomas, C. Przybylinski, G. E. Tinlay	T. R. Crockett	Indo-China Steam Navigation Co., Ltd.
Fengtien	F. Gibbs	J. Hunter, J. F. O'Connor, T. R. Young	U. In San	China Navigation Co., Ltd.
Foochow	F. Kelly	A. V. Harrison, R. A. Button, A. P. Sokoloff	P. S. Beryar	China Navigation Co., Ltd.
Fort Charlotte	D. B. C. Relph, O.B.E., D.S.C.	S. S. F. Dalgleish, J. Owen, P. P. Gardett	H. C. W. Rankin	Royal Fleet Auxiliary
Frosty Moller				Mollers' (Hong Kong), Ltd.
Fukien	I. Newton	J. R. Keddie, R. Perry, C. F. Chan	T. S. Leung	China Navigation Co., Ltd.
Green Ranger	E. Payne	A. M. Telser, A. D. Walters, W. Carr	A. M. A. Chandney	Royal Fleet Auxiliary
Greystoke Castle	L. Rowe	F. Kelly, J. E. Crowden, K. Rowe	D. G. Sirno	Mollers' (Hong Kong), Ltd.
Hai Lee	J. Hansen	—. Torkildsen, E. Tufte, H. Anderson	K. T. Ip	China Siam Line
Hai Meng	T. Stange-Olsen	O. Schibsted, E. Tohrmervik, A. Skjorwestad	K. T. Chan	China Siam Line
Hang Sang	L. W. Harrison	J. E. Williams, R. Grieve, A. Nelson	Lok Yung	Indo-China Steam Navigation Co., Ltd.
Hanyang	M. Defty	L. Walker, A. C. Ingles, P. Y. Lam	Lo Kin Chek	China Navigation Co., Ltd.
Heinrich Jessen	R. D. Nielsen	S. Chr. Jensen, O. K. Nielsen, K. P. Yip	E. Berlard	Jebsen & Co., Ltd.
Hermelin	S. Eliassen	T. Pedersen, A. Andersen, H. Berge		China Siam Line
Hermod	A. Apold	J. Eide, A. Holdoy, R. Gronvold	Y. H. So	China Siam Line
Hew Sang	E. J. Thomson	J. McFarlane, J. G. Perrin, H. Wood	H. K. Ho	Indo-China Steam Navigation Co., Ltd.
Hin Sang	G. W. F. Edwards	E. P. Ladbrooke, C. M. Wilson, J. M. Taylor	P. L. Ma	Indo-China Steam Navigation Co., Ltd.
Hiram	G. Hamre	G. Sundholm, J. Jacobsen, H. Fredenborg	C. H. Lai	China Siam Line
Hoi Houw	A. Fjeleheim	K. Munkejord, O. Ostedal, K. Kristoffersen	A. J. Takvam	Jebshun Shipping Co., Ltd.
Hoi Wong	M. Bjerjenes	M. Maland, O. Lindanger, M. Madsen	O. Torresdal	Jebshun Shipping Co., Ltd.

Name of Ship	Captain	Observing Officers	Senior Radio Officer	Shipping Company or Operators
Hunan	A. H. Finnie	V. Walker, P. C. J. Cockburn, C. C. Sieh	P. C. Choy	China Navigation Co., Ltd.
Hupeh	J. W. E. Warrior	J. C. Christal, C. Stark, C. F. Chan	Tsang Kau	China Navigation Co., Ltd.
Kut Sang	L. C. Cox	I. Rowland-Jones, E. Chase, M. T. G. Fish	J. L. Robertson	Indo-China Steam Navigation Co., Ltd.
Kweiyang	W. B. B. Paul	W. Pollock, S. W. Owen, J. H. Twibill	Lin Yuk Kong	China Navigation Co., Ltd.
Lok Sang	R. I. Groundwater	F. W. Cross, J. K. King, K. C. Yeung	J. E. Chew	Indo-China Steam Navigation Co., Ltd.
Mui Ann			A. Ovland	Chin Seng Hong Shipping Co., Ltd.
Mui Heng	Karl M. Svendsen	—. Martin, S. Severinsen, Egil Linge	Chang Shan Wai	Chin Seng Hong Shipping Co., Ltd.
Muncaster Castle	G. Anderson	W. A. Finlay, L. L. Watson, P. Potts, A. Layfield	V. B. Ritson	Mollers' (Hong Kong), Ltd.
Pakhoi	G. P. Cope	P. Flory, A. Harper, P. Bulatoff	Seung Kan	China Navigation Co., Ltd.
Poyang	D. C. Sim	W. E. Hargrave, A. Bartley, C. M. Li	Li San Kan	China Navigation Co., Ltd.
Produce	A. S. Bugge	T. Kobiesen, H. Sivertsen	T. Solheim	Karsten Larssen & Co. (Hong Kong), Ltd.
Sangola	J. B. Cooke	L. O. Harborow, J. M. Woolcock, J. R. D. McLeod	R. O. Smith	British India Steam Navigation Co.
Shansi	E. G. Thomas	W. J. Coburn, G. Young, W. C. Hsu	D. Fong Yan	China Navigation Co., Ltd.
Shengking	J. G. Smart	C. A. N. Baker, D. I. Robertson, S. K. Chen	R. M. Inwood	China Navigation Co., Ltd.
Shillong	H. J. M. Perry	J. P. McArthur, E. Snowden, C. B. Thompson	J. Mathews	P. & O. Steam Navigation Co.
Sinkiang	A. Taylor	P. H. Ward, F. W. Ridley, S. T. Sung	F. O. Chin	China Navigation Co., Ltd.
Sirdhana	W. Brown, M.B.E.	D. C. Murison, T. Woodward, D. T. Brown	J. E. Ward	British India Steam Navigation Co.
Soochow	A. Naismith	B. McLennan, A. C. Atkinson, S. N. Lai	R. R. Stevenson	China Navigation Co., Ltd.
Szechuen	L. V. Rowe	S. Davidson, W. T. Masters, V. A. Boutskai	P. L. Tsang	China Navigation Co., Ltd.
Tai Chung Shan	A. H. Bathurst	Lee Kong Yen, S. C. Chan	Chan So	Shun Cheong Steam Navigation Co., Ltd.
Taiyuan	Y. N. Campbell	A. Watson, H. A. Ledeboer, D.S.C., F. T. Quinn, R. J. Porter	D. F. Macdonald	China Navigation Co., Ltd.
Tak Sang	W. T. Rochester	W. J. Bartlett, J. M. Marshall, K. Y. Feng	E. A. West	Indo-China Steam Navigation Co., Ltd.
Tsinan		G. D. O. Rennie	Wai Pun Un	China Navigation Co., Ltd.
Wing Sang	H. G. Goddard	H. A. Greenwood, J. R. G. Findlay, W. E. McLackland	A. G. Lum	Indo-China Steam Navigation Co., Ltd.
Wo Sang	N. H. King	R. C. Traill, R. P. Farquhar, D. D. Battell	T. Ovens	Indo-China Steam Navigation Co., Ltd.
Yochow	F. Hindle	E. W. Woodcock, I. Robinson, K. W. Wu	S. C. Cheung	China Navigation Co., Ltd.
Yunnan	E. Bruce	G. A. Abbs, J. R. Suffren, D. J. Coombes	C. C. Tye	China Navigation Co., Ltd.

FLEET LIST (New Zealand)
VOLUNTARY OBSERVING SHIPS

The following is a list of observing ships, voluntarily co-operating with the Meteorological Service of New Zealand.

Name of Vessel	Captain	Observing Officer	Radio Officer	Owners
Selected Ships :				
Kaitoke	A. F. Inman	G. R. Inkster	L. M. Harvey	Union S.S. Co., Ltd.
Karitane	C. W. Dovey	W. Weatherup	A. E. Whalley	Union S.S. Co., Ltd.
Kauri	J. Billingham	R. E. P. Williams	G. B. Blake	Union S.S. Co., Ltd.
Komata	W. J. Hill	P. Nash	R. H. Willis	Union S.S. Co., Ltd.
Kopua	F. T. Chapman	I. G. Sykes	W. L. Lambie	Union S.S. Co., Ltd.
Korowai	R. Blampied, M.B.E.	L. J. Lynch	T. Roberts	Union S.S. Co., Ltd.
Koromiko	H. S. Collier	H. G. Harwood	W. Hawkins	Union S.S. Co., Ltd.
Kurow	F. W. Gibson	A. W. Hannam	B. G. Hart	Union S.S. Co., Ltd.
Matua	A. R. Russell	R. D. Bennett	H. A. Shields	Union S.S. Co., Ltd.
Maui Pomare	L. C. Boulton	J. Hare	W. A. Taylor	Government of New Zealand
Monowai	G. B. Morgan, D.S.O.	K. D. Mitchell	J. G. Rea	Union S.S. Co., Ltd.
Piri	M. W. Monaghan	J. Drummond		I.C.I., Ltd.
Port Waikato	C. Keith	J. Flette		Holm & Co.
Waipori	S. C. Angus	R. K. Brown	J. Anderson	Union S.S. Co., Ltd.
Wairata	W. E. Jones	P. W. Callender	A. A. Lindsay	Union S.S. Co., Ltd.
Wairimu	C. Burgess	J. G. Waites	C. Ward	Union S.S. Co., Ltd.
Waitaki	E. F. Rainbow	R. G. Anderson	B. Sword	Union S.S. Co., Ltd.
Waitemata	D. M. Keith	J. A. Barbour		Union S.S. Co., Ltd.
Supplementary Ships :				
James Cook	A. Deed	E. G. Rapley	A. J. Jeans	H. C. S. Coasters
Kaimiro	D. C. Champion	H. A. Hodkinson		Union S.S. Co., Ltd.
Kakapo	R. Ainsworth	E. G. Trousdale	E. A. Miller	Union S.S. Co., Ltd.
Kamo	A. W. Pert	S. Peterson		Union S.S. Co., Ltd.
Karepo	W. Kehoe	E. M. Bieneman		Union S.S. Co., Ltd.
Kartigi				Union S.S. Co., Ltd.
Kiwitea	G. M. Schofield	A. B. MacDonald	R. N. Dennis	Union S.S. Co., Ltd.
Manuka	E. J. Johnston			Chatham Fishing Co.
Omana	H. L. P. Brown	H. J. Southworth	H. T. Fernandes	Union S.S. Co., Ltd.
Viti	F. A. Barrett	L. Lindsay		Tasman S.S. Co., Ltd.

FLEET LIST (South Africa)

The following is a list of observing ships voluntarily co-operating with the Meteorological Service of South Africa.

Name of Ship	Captain	Observing Officer	Senior Radio Officer	Shipping Company or Operator
Africana II	R. L. V. Shannon, O.B.E.	A. Thomas, D.S.C.		Department of Fisheries, Cape Town
Agulhas	T. Y. Thompson	A. Harvey	E. Grover	South African Railways Ships, Cape Town
Aloe	R. Lewis	K. M. Botha	R. Parker	South African Railways Ships, Cape Town
Baltic Coast	H. H. Coor	L. W. Coltham	R. E. Star	Thesen's Steamship Co., Cape Town
Bokkeveld	A. W. Jewiss	I. A. Clark	F. P. Garnett	Arden Hall Steamship Co., Pretoria
Constantia	A. M. Barlow	P. A. T. Gordon	I. D. Flood	South African Marine Corporation, Cape Town
Damaraland	N. Waiter	M. A. Hoffman	J. Stamp	South African Lines, Ltd., Cape Town
Empire Victory				Union Whaling Co., Ltd.
Gilia	J. Lundberg			Irvin & Johnston, Ltd., Cape Town
Kaapland	C. B. Adkins	P. D. Aldworth	M. Hutchons	South African Lines, Cape Town
Morgenster	F. D. Wilkinson	H. M. Stephens	G. Adey	South African Marine Corporation, Cape Town
Namaqualand	B. Parnaby	C. B. O'Connor	P. Goggin	South African Lines, Cape Town
Pequenea		M. T. Scott		Tristan Exploration Co., Cape Town
Vergelegen	D. W. Thorpe	N. T. Casley	P. Boyd	South African Marine Corporation, Cape Town
South African Nautical College:				
General Botha	G. V. Legassick, D.S.C., R.D., Cdr., R.N.R.	The Senior Cadets		

FLEET LIST (India)

The following is a list of observing ships, voluntarily co-operating with the India Meteorological Department.

Name of Vessel	Owners
Selected Ships :	
Alavi	Mogul Line, Ltd.
Bahadur	Asiatic Steam Nav. Co. Ltd.
Chanda	British India Steam Nav. Co. Ltd.
Dara	British India Steam Nav. Co. Ltd.
Dumra	British India Steam Nav. Co., Ltd.
Dwarka	British India Steam Nav. Co., Ltd.
Englestan	Scindia Steam Nav. Co., Ltd.
Havildar	Asiatic Steam Nav. Co. Ltd.
Islami	Mogul Line, Ltd.
Jaladuta	Scindia Steam Nav. Co., Ltd.
Jalaganga	Scindia Steam Nav. Co., Ltd.
Jalamani	Scindia Steam Nav. Co., Ltd.
Jalarashmi	Scindia Steam Nav. Co., Ltd.
Jalaveera	Scindia Steam Nav. Co., Ltd.
Jalavihar	Scindia Steam Nav. Co., Ltd.
Jalayamuna	Scindia Steam Nav. Co., Ltd.
Jal-azad	Scindia Steam Nav. Co., Ltd.
Jehangir	Mogul Line, Ltd.
Kampala	British India Steam Nav. Co., Ltd.
Karanjia	British India Steam Nav. Co., Ltd.
Khandalla	British India Steam Nav. Co., Ltd.
Khosrou	Mogul Line, Ltd.
Mahadevi	Asiatic Steam Nav. Co., Ltd.
Maharaja	Asiatic Steam Nav. Co., Ltd.
Nadir	Asiatic Steam Nav. Co., Ltd.
Nurjehan	Asiatic Steam Nav. Co., Ltd.
Rajput	Asiatic Steam Nav. Co., Ltd.
Rajula	British India Steam Nav. Co., Ltd.
Shahjehan	Asiatic Steam Nav. Co., Ltd.
Singu	Burmah Oil Co. (Tankers), Ltd.
Sirsa	British India Steam Nav. Co., Ltd.
Subedar	Asiatic Steam Nav. Co., Ltd.
Tairea	British India Steam Nav. Co., Ltd.
Vasna	British India Steam Nav. Co., Ltd.
Warla	British India Steam Nav. Co., Ltd.
Yenangyaung	Burmah Oil Co. (Tankers), Ltd.
Supplementary Ships :	
Akbar	Mogul Line, Ltd.
Badarpur	Burmah Oil Co. (Tankers), Ltd.
Barala	British India Steam Nav. Co., Ltd.
Begum	Asiatic Steam Nav. Co., Ltd.
Bharatjal	Bharat Line, Ltd.
Bharatrani	Bharat Line, Ltd.
Itaura	British India Steam Nav. Co., Ltd.
Jaladurga	Scindia Steam Nav. Co., Ltd.
Jalagopal	Scindia Steam Nav. Co., Ltd.
Jalajawahar	Scindia Steam Nav. Co., Ltd.
Jalakrishna	Scindia Steam Nav. Co., Ltd.
Jalamayur	Scindia Steam Nav. Co., Ltd.
Jalaprakash	Scindia Steam Nav. Co., Ltd.
Jalaratna	Scindia Steam Nav. Co., Ltd.
Jalavijaya	Scindia Steam Nav. Co., Ltd.
Masimpur	Burmah Oil Co. (Tankers), Ltd.
Nurani	Asiatic Steam Nav. Co., Ltd.
Risaldar	Asiatic Steam Nav. Co., Ltd.
Rizwani	Mogul Line, Ltd.

FLEET LIST (Canada)
VOLUNTARY OBSERVING SHIPS

The following is a list of observing ships voluntarily co-operating with the Meteorological Service of Canada.

Name of Vessel	Owners
Selected Ships	
Aorangi	Canadian Australasian Line.
Canadian Challenger	" Canadian Challenger ", Ltd. (Canadian National Steamships).
Canadian Constructor	" Canadian Constructor ", Ltd. (Canadian National Steamships).
Canadian Cruiser	" Canadian Cruiser ", Ltd. (Canadian National Steamships).
Esso Knoxville	Imperial Oil, Ltd.
Fort Amherst	Furness, Withy & Co.
Fort Townshend	Furness, Withy & Co.
Imperial Alberta	Imperial Oil, Ltd.
Imperial Charlottetown	Imperial Oil, Ltd.
Imperial Fredericton	Imperial Oil, Ltd.
Imperial Quebec	Imperial Oil, Ltd.
Imperial Toronto	Imperial Oil, Ltd.
Imperial Winnipeg	Imperial Oil, Ltd.
John S. Pillsbury	Upper Lakes and St. Lawrence Transportation Co. Ltd
Lady Nelson	" Lady Nelson ", Ltd. (Canadian National Steamships).
Lady Rodney	" Lady Rodney ", Ltd. (Canadian National Steamships).
Lake Minnewanka	Western Canada Steamship Co., Ltd.
Lake Pennask	Western Canada Steamship Co., Ltd.
Lake Sicamous	Western Canada Steamship Co., Ltd.
Lake Winnipeg	Western Canada Steamship Co., Ltd.
Ottawa Valley	Montreal, Australia, New Zealand Line, Ltd.
Waihemo	Canadian Union Line, Ltd.
Waikawa	Canadian Union Line, Ltd.
Wairuna	Canadian Union Line, Ltd.
Waitomo	Canadian Union Line, Ltd.
Lightships :	
Lurcher Lightship	Minister of Transport.
Sambro Lightship	Minister of Transport.
Supplementary Ships:	
Lake Manitou	Western Canada Steamship Co., Ltd.
Pinnacles	Deep-Sea Tankers, Ltd.
Rupertsland	Hudson's Bay Co., Ltd.
Tantara	Johnson Walton Steamships, Ltd.

LIGHT VESSELS

The following Light Vessels voluntarily observe and report from coastal waters of Great Britain.

Name of Vessel	Masters
Dowsing	J. R. Audley, S. R. Smith
East Goodwin	A. Giblin, F. M. England
Galloper	S. J. Vincent
Humber	F. I. Butcher, L. A. Brett
Newarp	B. Hadden, R. J. Middleton
Royal Sovereign	W. J. Sheaf
Shipwash	G. W. Broom, C. G. Isaac
Smith's Knoll	W. J. Hall, J. W. R. Reeve

MARID SHIPS

The following is a list of ships voluntarily observing and reporting sea temperatures from coastal waters of Great Britain. Captains are requested to point out any errors or omissions in the list.

Name of Vessel	Call Sign	Captain	Owners/Managers
Actuality	GPPF	W. Conn	F. T. Everard & Sons, Ltd.
Allurity	MQFS	W. N. Fisher	F. T. Everard & Sons, Ltd.
Amsterdam	MFBP	C. R. Baxter, D.S.C.	British Railways (Eastern Region)
Angelo	GQFY	S. N. Stokes	Ellerman's Wilson Line, Ltd.
Ariosto	GKPW	A. Morrill	Ellerman's Wilson Line, Ltd.
Atlantic Coast	GWSY	P. A. Johnson	Coast Lines, Ltd.
Baltraffic	GTXN	F. S. J. Butcher	United Baltic Corporation, Ltd.
Belhaven	MNXZ	P. L. Irvine	London & Edinburgh Shipping Co., Ltd.
Belravock	MKGV	T. Wallace	London & Edinburgh Shipping Co., Ltd.
Belvina	MLZF	J. Philip	London & Edinburgh Shipping Co., Ltd.
Borthwick	MNWK	G. Simpson	Geo. Gibson & Co., Ltd.
British Scout	GJKD	R. S. Hughes	British Tanker Co., Ltd.
Cambria	GBKT	J. Hughes	British Railways (London Midland Region)
Clupea	GOAJ	J. Jappy	Scottish Home Department (Fishery Division).
Corfen	GDJX	E. R. W. Allen	Wm. Cory & Son, Ltd.
Corfleet	GWTD	A. G. Waller	Wm. Cory & Son, Ltd.
Corfoss	MAHX	F. E. W. Farrant	Wm. Cory & Son, Ltd.
Cormain	MAHT	R. B. Armstrong	Wm. Cory & Son, Ltd.
Cormead	GDBX	T. Slack	Wm. Cory & Son, Ltd.
Cormist	GDVT	R. J. Barrow	Wm. Cory & Son, Ltd.
Cormoat	GLKV	J. U. Hansen	Wm. Cory & Son, Ltd.
Cormull	MAHS	E. S. Keene	Wm. Cory & Son, Ltd.
Corncrake	MJKL	R. Warren	General Steam Nav. Co., Ltd.
Crane	MMCS	W. J. Kelly	General Steam Nav. Co., Ltd.
Drake	MMYC	R. B. Langley	General Steam Nav. Co., Ltd.
Duke of Argyll	GNVX	F. Adern, D.S.C.	British Railways (London Midland Region)
Duke of Lancaster	GCPQ	E. B. Serjeant	British Railways (London Midland Region).
Duke of Rothesay	GNVL	H. Thompson	British Railways (London Midland Region).
Eildon	MLZL	J. Little	G. Gibson & Co., Ltd.
Empire Cedric	GRSC	W. N. Johnson	Frank Bustard & Sons, Ltd.
Empire Gaelic	MAVR	H. T. Green	Frank Bustard & Sons, Ltd.
Explorer	MRCZ	J. Finlayson	Scottish Home Department (Fishery Division).
Falcon	MNXL	S. W. Develin	General Steam Nav. Co., Ltd.
Golden Dawn	—	Lieut. A. Adamson, M.B.E., R.N.R.	The Captain.
Grebe	MAEY	E. C. Painter, D.S.C.	General Steam Nav. Co., Ltd.
Guernsey Coast	MANS	F. C. Lucas, M.B.E.	British Channel Islands Shipping Co., Ltd.
Harrogate	MNDB	D. Stokes	Associated Humber Lines.
Hibernia	MBMT	R. Woodhall	British Railways (London Midland Region).
Highwood	MLQQ	J. Coupland	E. R. Newbigin, Ltd.
Hindlea	GWDQ	P. Cullen	Hindlea Shipping Co., Ltd.
Horsa	MPFJ	D. Dickson	Currie Line, Ltd.
Isle of Guernsey	GQYJ	F. E. Trout	British Railways (Southern Region).
Isle of Jersey	GRBQ	A. Light	British Railways (Southern Region).
London Merchant	MBRZ	C. A. Piper	London Scottish Lines, Ltd.
Malmo	GQCN	A. D. Seath	Ellerman's Wilson Line, Ltd.
Melrose	MCFD	G. Simpson	Geo. Gibson & Co., Ltd.
Melrose Abbey	GSYW	J. Laverack	Associated Humber Lines.
Minna	GKPS	T. Mather	Scottish Home Department (Fishery Division).
Moray Coast	MKDL	J. T. Williams	Coast Lines, Ltd.
Ocean Coast	GYMP	G. Mearns	Coast Lines, Ltd.
Petrel	MBGV	R. Beattie, M.B.E.	General Steam Nav. Co., Ltd.
Plover	MLLV	A. L. Ward	General Steam Nav. Co., Ltd.
St. Clair	MMFX	T. Gifford	North of Scotland & Orkney & Shetland Steam Nav. Co., Ltd.
St. Clement	GRGM	W. J. Ramsay	North of Scotland & Orkney & Shetland Steam Nav. Co., Ltd.
St. Helier	GLBT	R. Pitman, D.S.C.	British Railways (Western Region).
St. Julien	GLBV	L. J. Richardson	British Railways (Western Region).
St. Magnus	GFYK	W. G. Stout	North of Scotland & Orkney & Shetland Steam Nav. Co., Ltd.
St. Ninian	GJBB	A. M. Dundas	North of Scotland & Orkney & Shetland Steam Nav. Co., Ltd.
Salerno	GSPW	D. B. Ramsbottom, D.S.C.	Ellerman's Wilson Line, Ltd.
Selby	MLFT	G. Briggs	Associated Humber Lines.
Slieve Bawn	MQCC	W. N. Greenwood	British Railways (London Midland Region).
Slieve Bearnagh	MLNL	A. E. Willmott, D.S.C., R.D., Cdr. R.N.R.	British Railways (London Midland Region).
Slieve Bloom	MQDD	W. E. Meade	British Railways (London Midland Region).
Slieve Donard	MQCQ	A. C. Borthwick	British Railways (London Midland Region).
Slieve League	MQCM	R. A. H. Lord, D.S.C., R.D., Lt.-Cdr. R.N.R.	British Railways (London Midland Region).
Slieve More	MQBM	N. Lloyd Williams	British Railways (London Midland Region).
Southern Coast	MASD	G. Goldman	Coast Lines, Ltd.
Truro	GJTQ	J. B. Dunkley	Ellerman's Wilson Line, Ltd.
Vanellus	GDVW	J. E. Green	British & Continental S.S. Co., Ltd.
Vienna	GTBR	A. Pearson Sultan	British Railways (Eastern Region).

NOTICES TO MARINE OBSERVERS

Postal Arrangements

The quarterly numbers of *The Marine Observer* are published on the last Wednesdays of December, March, June and September.

The Marine Observer is addressed to the Captain, S.S./M.V....., c/o the owners, and captains are requested to make their own arrangements for forwarding.

Shipowners, Marine Superintendents, and all concerned in the despatch of mails to ships are asked to kindly facilitate the despatch and delivery of mail received at their offices from the Meteorological Office and " Air Publications and Forms Stores ", to their ships abroad.

Addressed to the captains of ships, this contains information required for the conduct of meteorological work at sea, and is most effective if received by the captains at the earliest possible date.

" The Marine Observer "

Captains of observing ships are requested to ensure that all officers, who participate in the voluntary meteorological work carried out by the ship, have access to *The Marine Observer*.

Ice Observation

Drifting ice, derelicts, and other floating dangers to navigation are reported by all means of communication at the disposal of the master.

See Chapter 12, pages 96–98 of the *Marine Observer's Handbook*, Seventh Edition.

It is also desirable that more detailed information than can be given in a TTT wireless message should be available to the Meteorological Office for the purpose of research, and for Admiralty Charts and Sailing Directions.

Marine observers will greatly assist by noting the conditions of ice, either drifting or fast, in the pages provided at the end of the logbook (Form 911), or on Form 912, which may be supplied to the captain of any British ship on application to a Port Meteorological Officer or Merchant Navy Agent.

Observing ships using the Trans-North Atlantic tracks are requested to record not only when ice is encountered, but also when they have passed through the ice region during the ice season without encountering ice. In this case a " nil " report should be returned, since it is desirable as far as possible to determine when tracks have been clear of ice.

RETURN OF LOGBOOKS

Owing to the need for strict economy in the use of paper, observing officers should endeavour to fill up their logbooks (Forms 911), before returning them to the appropriate Meteorological Service, except when insufficient space remains for the recording of observations during a further complete passage.

Meteorological Services for Shipping

Captains of British ships are requested to notify the Marine Branch of the Meteorological Office of areas in which meteorological services for shipping appear inadequate. Suggestions for the improvement of these services are always welcome.

Indicator "OBS" in Radio Weather Messages

The attention of marine observers and particularly of radio officers in Observing Ships is drawn to the necessity of strict adherence to the use of the indicator—"OBS"—preceding the telegraphic address to which the radio weather message is transmitted. Failure to comply with this regulation leads to considerable delay in the clearance of the weather messages.

Atlantic Weather Bulletin for Shipping (Great Britain)

On and after 1st April, 1951, the following schedule (broadcast from Portishead Radio) should replace that published on page 34 of M.O. 509 *Decode for Use of Shipping*.

PARTS	G.M.T.	APRIL TO SEPTEMBER, 1951		OCTOBER, 1951 TO MARCH, 1952	
		Call sign	Frequencies kc/s (wavelengths)	Call sign	Frequencies kc/s (wavelengths)
I	0930*	GBZ	19.4 (15465)	GBZ	19.4 (15465)
		GKB 3	8340 (35.97)	GKB 5	16440 (18.25)
II		GKC 3	8210 (36.54)	GKC 3	8210 (36.54)
		GKC 4	12612 (23.79)	GKC 4	12612 (23.79)
III	2130*	GBZ	19.4 (15465)	GBZ	19.4 (15465)
V		GKB 3	8340 (35.97)	GKT 2	6443 (46.56)
		GKC 4	12612 (23.79)	GKC 3	8210 (36.54)
VI		GKC 5	16885 (17.77)	GKC 4	12612 (23.79)
IV	1130	GBZ	19.4 (15465)	GBZ	19.4 (15465)
		GKB 4	12678 (23.66)	GKB 5	16440 (18.25)
		GKC 4	12612 (23.79)	GKC 5	16885 (17.77)
		GKC 5	16885 (17.77)	GKC 6	22010 (13.63)

*Preceded by navigational warnings.

GREAT BRITAIN—LOCAL WEATHER FORECASTS

Masters of ships and others interested in the movements of shipping and in the loading and discharging of cargo can obtain local weather forecasts from the forecast centre nearest to the port, free of charge.

The addresses and telephone numbers of the forecast centres nearest to the main ports of Great Britain are given below.

Enquirers by Telephone should ask for "The Forecaster."

PORT	ADDRESS OF NEAREST FORECAST CENTRE	TELEPHONE NO.
Aberdeen	The Meteorological Officer, Dyce Airport, Aberdeenshire	Dyce 331. Ex. 70
Bristol	The Meteorological Officer, Bristol Airport, Whitchurch, Bristol	Bristol 26451. Ex. 22
Cardiff	The Senior Meteorological Officer, Air Traffic Control Centre, Royal Air Force, Eastern Avenue, Barnwood, Gloucester	Gloucester 24465/6/7. Ex. 110, 111.
Dundee	The Senior Meteorological Officer, H.Q. No. 18 Group, Royal Air Force, Pitreavie Castle, Dunfermline, Fife	Inverkeithing 264/5 Ex. 118/9.
Falmouth	The Senior Meteorological Officer, H.Q. 19 Group, Royal Air Force, Mount Batten, Plymouth, Devon	Plymstock 2224. Ex. 108/9.
Glasgow	The Meteorological Officer, Renfrew Airport, Renfrewshire	Renfrew 2352. Ex. 21/3.
Hartlepool	The Senior Meteorological Officer, Royal Air Force, Watnall, Nottingham	Nottingham 45731/5. Ex. 230/1.
Hull	The Senior Meteorological Officer, H.Q. No. 1 Group, Royal Air Force, Bawtry, Doncaster, Yorkshire	Bawtry 363/7. Ex. 105
Kirkwall	The Meteorological Officer, Grimsetter Airport, Kirkwall, Orkney	Kirkwall 421. Ex. 29.
Leith	The Senior Meteorological Officer, H.Q. No. 18 Group, Royal Air Force, Pitreavie Castle, Dunfermline, Fife	Inverkeithing 264/5 Ex. 118/9.
London	The Director, Meteorological Office, Air Ministry, Kingsway, London, W.C.2	Holborn 3434. Ex. 629.
Liverpool	The Senior Meteorological Officer, Speke Airport, Liverpool, 19	Garston 1240. Ex. 21/2.
Milford Haven	The Senior Meteorological Officer, H.Q. No. 19 Group, Royal Air Force, Mount Batten, Plymouth, Devon	Plymstock 2224. Ex. 108/9.
Newcastle	The Senior Meteorological Officer, Royal Air Force, Watnall, Nottingham	Nottingham 45731. Ex. 230/1.
Plymouth	The Senior Meteorological Officer, H.Q. No. 19 Group, Royal Air Force, Mount Batten, Plymouth, Devon	Plymstock 2224. Ex. 108/9.
Southampton	The Senior Meteorological Officer, Southampton Airport	Eastleigh 87228. Ex. 8/10.
Swansea	The Senior Meteorological Officer, Air Traffic Control Centre, Royal Air Force, Eastern Avenue, Barnwood, Gloucester	Gloucester 24465/6/7. Ex. 110/111

NAUTICAL OFFICERS AND AGENTS OF THE MARINE DIVISION OF THE METEOROLOGICAL OFFICE, GREAT BRITAIN

Captains and observing officers of the Voluntary Corps of Marine Observers will always be welcomed at headquarters, where the Marine Superintendent will be pleased to show them how their observations are utilised in meteorological research and weather forecasting.

Headquarters—Commander C. E. N. Frankcom, O.B.E., R.D., R.N.R., Marine Superintendent, Meteorological Office, Air Ministry, Headstone Drive, Harrow, Middlesex. (Telephone : Harrow 4331, Ext. 324.)

Commander J. Hennessy, R.D., R.N.R., Deputy Marine Superintendent. (Telephone : Harrow 4331, Ext. 323.)

Mersey.—Commander M. Cresswell, R.N.R., Port Meteorological Officer, Room 617, Royal Liver Building, Liverpool, 3. (Telephone : Central 6565.)

Thames.—Commander C. H. Williams, R.D., R.N.R., Port Meteorological Officer, Room 218, Ibex House, Minories, London, E.C.3. (Telephone : Royal 1721.)

Bristol Channel.—Mr. J. C. Matheson, Port Meteorological Officer, 2 Bute Crescent, Cardiff. (Telephone : Cardiff 4474.)

Southampton.—Captain J. R. Radley, Port Meteorological Officer, 19 Queen's Terrace, Southampton. (Telephone : Southampton 4295.)

Clyde.—Captain R. Reid, Port Meteorological Officer, 53 Bothwell Street, Glasgow. (Telephone : Glasgow Central 2558.)

AGENTS

Forth.—Captain G. More, " Craigneuk ", Dechmont, West Lothian. (Telephone : Dechmont 19.)

Humber.—Captain R. E. Dunn, c/o Principal Officer, Ministry of Transport, Trinity House Yard, Hull. (Telephone: Hull 38613.)

Tyne.—Captain F. B. West, Custom House Chambers, Quayside, Newcastle-on-Tyne. (Telephone : Newcastle 23203.)

OFFICERS OF THE METEOROLOGICAL SERVICES OF THE BRITISH COMMONWEALTH

AUSTRALIA

Melbourne.—Lieut.-Commander S. W. S. Robertson, D.S.C., R.A.N., Port Meteorological Officer, Meteorological Branch, Department of Interior, P.O. Box 1289K, Melbourne, Victoria. (Telephone : F.J. 9171.)

BRITISH EAST AFRICA

Dar-es-Salaam.—Meteorologist-in-Charge, Meteorological Department, Post Office Box 597. (Telephone : 2297.)

BRITISH WEST AFRICA

Accra.—The Chief Meteorologist, Meteorological Office. (Telephone : Accra 672.)

Bathurst.—The Meteorologist, Meteorological Office, Yundum. (Telephone : Yundum Airport, Ext. 9 and 21.)

Freetown.—The Meteorologist, Meteorological Office, Lungi. (Telephone: Lungi, Ext. 8.)

Lagos.—The Chief Meteorologist, Meteorological Office, Ikeja. (Telephone: Lagos 1081, Ext. 1.)

CANADA

Headquarters.—Controller, Meteorological Division, Department of Transport, 315 Bloor Street W., Toronto, 5.

Halifax.—O.I.C. Dominion Public Weather Office, 728 Dominion Public Building, Halifax, N.S. (Telephone: 3–8314.)

Saint John—Officer-in-Charge, The Observatory, Saint John, N.B. (Telephone: 3–3500.)

Vancouver.—Mr. R. F. Kennett, 815 Bower Building, 543 Granville Street, Vancouver, B.C. (Telephone: PAcific 3032.)

FIJI

Suva—Observer-in-Charge, Meteorological Office, Lauthala Bay.

HONG KONG

W. B. Goodfellow, Marine Liaison Officer, Royal Observatory. (Telephone: 58038.)

INDIA

Bombay.—The Director, Regional Meteorological Centre, Colaba, Bombay, 5. (Telephone: 35378.)

Calcutta.—The Director, Regional Meteorological Centre, Alipore, Calcutta, 27. (Telephone: South 2782.)

Madras.—The Director, Regional Meteorological Centre, Nakshatra Bungla, College Road, Madras, 6. (Telephone: 8109.)

MALAYA

Singapore.—The Director, Malayan Meteorological Service, Sixth Floor, Fullerton Building. (Telephone: 7123.)

NEW ZEALAND

Headquarters.—The Director, Meteorological Office, Kelburn, Wellington, New Zealand. (Telephone: 44418.)

Wellington.—Marine Meteorological Officer, Post Office Box 72. (Telephone: 44–418, Ext. 930.)

Auckland.—Port Meteorological Officer, Meteorological Office, Mechanics Bay, Auckland. (Telephone: 49551.)

Lyttleton.—Officer-in-Charge, Meteorological Office, Wigram Aerodrome. (Telephone: 32–585.)

Dunedin.—Officer-in-Charge, Meteorological Office, Taieri Aerodrome, Dunedin. (Telephone: 21–666.)

PAKISTAN

Chittagong.—The Director, Regional Meteorological Centre, Diwan, Bazar. (Telephone: 202).

Karachi.—The Director, Regional Meteorological Centre, Meteorological Office, Karachi Airport, Karachi. 11. (Telephone: 9280, 9281, 2894, 2895, 2896, Ext. 225.)

SOUTH AFRICA

Cape Town.—A. B. Crawford, Meteorological Office, Post Office, Maitland, Cape Town.

Meteorology for Aviators

By R. C. SUTCLIFFE, Ph.D.

★

THIS volume aims to present in a compact form the aspects of meteorology important in aviation. The pilot of average keenness who wishes to make himself sufficiently a master of the subject for success and efficiency in his profession will find Dr. Sutcliffe's book very useful, as it covers the necessary field with the proper perspective. It is of particular interest to those who have neither the time nor always the inclination to study the whole literature of meteorological science, and who may not have the basic scientific training necessary to follow the presentation in the more technical publications.

With Charts

Price 7*s.* 6*d.* *By post* 8*s.* 0*d.*

Obtainable from

HIS MAJESTY'S STATIONERY OFFICE

at the addresses shown on the title page
or through any bookseller.

24018. Wt. 5. 27. 4/51. K12. S.P. & S. G.9.8.8.

ABRIDGED LIST OF PUBLICATIONS OF THE METEOROLOGICAL OFFICE

Publications may be ordered from the Sale Offices of His Majesty's Stationery Office at the addresses shown on the title page or through any bookseller

Cloud Forms. Definitions and descriptions, with photographs of clouds. M.O. 233, 6th Edition, 1949, reprinted 1950. 1*s.* 3*d.* (1*s.* 4*d.*)

Weather Map. An introduction to modern meteorology. M.O. 225 i, 3rd edition, 1939; reprinted 1950 (see also Meteorological Glossary, in continuation of the "Weather Map"). 3*s.* 6*d.* (3*s.* 8*d.*)

Meteorological Glossary (continuation of the "Weather Map", *q.v.*). M.O. 225 ii, 3rd edition, 1939, reprinted 1950. 8*s.* 6*d.* (8*s.* 11*d.*)

Handbook of Weather Messages, Codes and Specifications. M.O. 510.

Part I. Transmission schedules and station index numbers. 1949. 2*s.* 6*d.* (2*s.* 8*d.*)

Part II. Codes and specifications. 1948, reprinted 1950. 2*s.* 6*d.* (2*s.* 8*d.*)

Part III. Coding, decoding and plotting. 1948, reprinted 1950. 2*s.* (2*s.* 2*d.*)

(*Amendments issued as necessary and priced separately.*)

Instructions for the preparation of weather maps with tables of the specifications and symbols. M.O. 515. 1949, reprinted 1950. 9*d.* (10*d.*)

International Meteorological Code adopted by the International Meteorological Organisation, Washington, 1947. **Decode for the use of shipping,** incorporating the code for weather reports from and to ships and the analysis code for the use of shipping. M.O. 509, 2nd edition, 1950. 1*s.* (1*s.* 1*d.*)

Meteorological Handbook for Pilots and Navigators. M.O. 448, 2nd edition, 1942, reprinted 1950. 2*s.* 6*d.* (2*s.* 9*d.*)

A Short Course in Elementary Meteorology. By W. H. Pick, B.Sc., F.C.P., F.Inst.P. M.O. 247, 5th edition, 1938, reprinted 1950. 2*s.* 6*d.* (2*s.* 9*d.*)

Meteorology of Airfields. By C. S. Durst, B.A. M.O. 507, 1949, reprinted 1950. 2*s.* (2*s.* 2*d.*)

Prices in brackets include postage